12.2.5 Cambio

Cambio Healthcare Systems is a market leading Electronic Patient Record (EPR) company headquartered in Stockholm, Sweden with offices in the UK, Sweden, Denmark and Sri-Lanka. Cambio COSMIC® is a patient-centered integrated EPR system for comprehensive and clinical healthcare solutions with a focus on patient safety. Cambio COSMIC® offers solutions within all healthcare sectors and is used by over 100,000 clinicians and healthcare professionals.[1]

For more information please visit http://www.cambiohealthcare.co.uk/.

The Cambio COSMIC® Electronic Patient Record system has been under continuous development since 1993. Cambio has applied innovations within healthcare informatics in areas such as information models, clinical terminology and formal languages for expressing clinical decision support rules. The COSMIC® EPR combines openEHR archetypes, SNOMED CT terminology and Guideline Definition Language rules in implementations which benefit patients, clinical staff and healthcare enterprise management. Using these technologies, their system is able to incorporate advanced analytics capabilities.

Decision Support

Cambio uses the Guideline Definition Language (GDL) to combine archetypes, terminologies and clinical decision support rules. GDL provides:

- Bindings between archetype elements and variables in the rules;
- Rule expressions that are easily converted to industry rule engine languages;
- Bindings between local concepts used in the rules and concepts from SNOMED CT.

GDL rules can be used to trigger a variety of system actions, including pre-filling a form, proposing a test or prescription, or sending a notification to the system user. The criteria for triggering actions from GDL rules may be based on demographics data, the context of care (e.g. clinic or inpatient), current medications and diagnoses, or observation values (e.g. lab results).

Decision support rules created in COSMIC® are authored using an editor. Figure 12.2.5-1 shows the high level view of a rule for calculating a complex clinical risk-score (CHA$_2$DS$_2$-VASc Score for stroke risks stratification in atrial fibrillation).

Figure 12.2.5-1: Creating rules for CHA2DS2-VASc calculation

At the more detailed level, criteria may be defined using SNOMED CT concepts and subsets of concepts (as simple refsets). Figure 12.2.5-2 below shows a section of a decision support rule which identifies patients with heart failure

```
["gt0017"] = (RULE) <
    when = <"$gt0003|diagnosis| is_a local::gt0100|Heart failure|",...>
    then = <"$gt0012=1|local::at0028|Present|",...>
    priority = <10>
>

term_bindings = <
    ["SNOMEDCT"] = (TERM_BINDING) <
        bindings = <
            ["gt01000"] = (BINDING) <
                codes =<[SNOMEDCT::84114007],...>
            >
        >
    >
    ["ICD10"] = (TERM_BINDING) <
        bindings = <
            ["gt01000"] = (BINDING) <
                codes =<[ICD10::I50],...>
            >
        >
    >
    ["ICD9"] = (TERM_BINDING) <
        bindings = <
            ["ICD9"] = (BINDING) <
                codes =<[ICD9::428.0],...>
            >
        >
    >
>
```

a local term is used as a proxy to externally defined concepts in reference terminologies

a local term can be bound to list of concepts or a refset in different target reference terminologies

Figure 12.2.5-2: Excerpt of GDL Rule showing binding to SNOMED CT and ICD

Identification of suitable patients for research studies is a particular challenge to clinicians working in a routine clinic setting. A clinician may encounter eligible cases very rarely or simply not be familiar with the specific study selection criteria. In order to study diseases, their courses and causes, what causes or affects a particular condition, and the effects of different medications, researchers need trial subjects to meet specific criteria.

Off-Line Reporting and Data Warehousing

COSMIC Intelligence is a data warehouse and reporting application. Analyses and reports that do not require real time information are produced within this separate analysis system. COSMIC Intelligence is a data store optimized for queries, retrieval and output of data. Data is periodically retrieved from the 'live' clinical system, transformed and loaded into the data store.

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[1] www.cambiohealthcare.co.uk/

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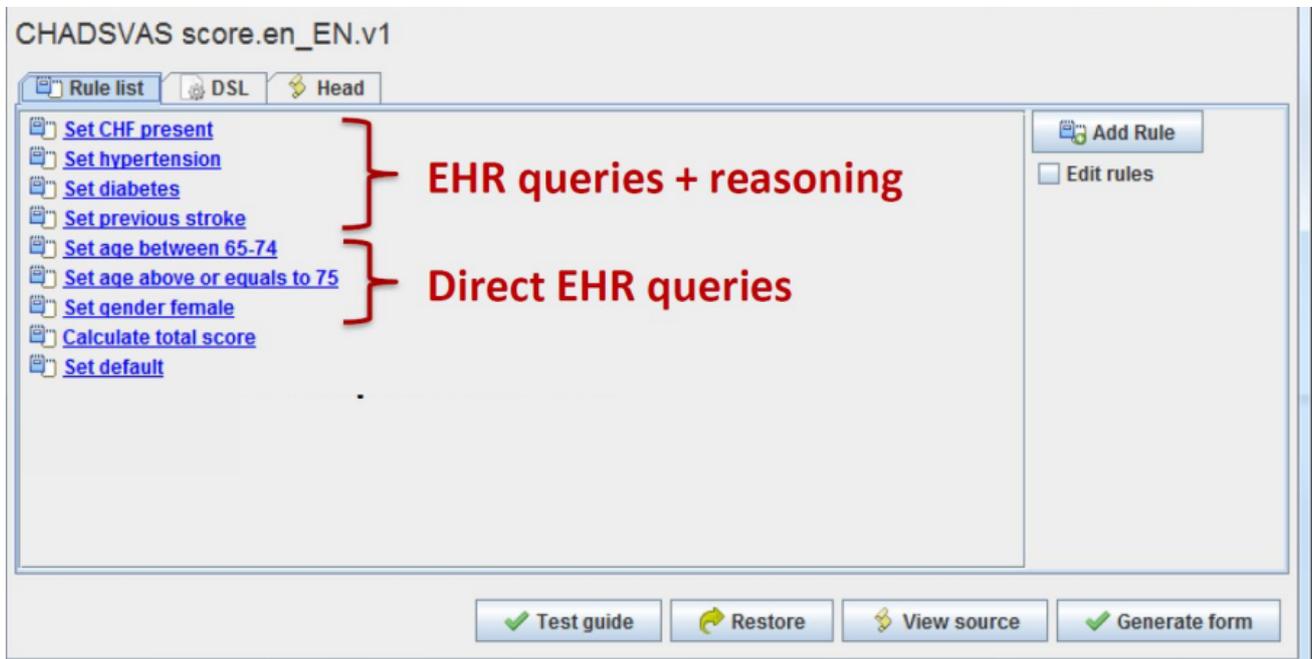

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