



GDL & CDS Update

openEHR Roadmap Meeting
Oslo, September 2014

Iago Corbal, Rong Chen MD PhD

Outline

- Introduction
- CDS Requirements & Design
- GDL Roadmap
- Discussions

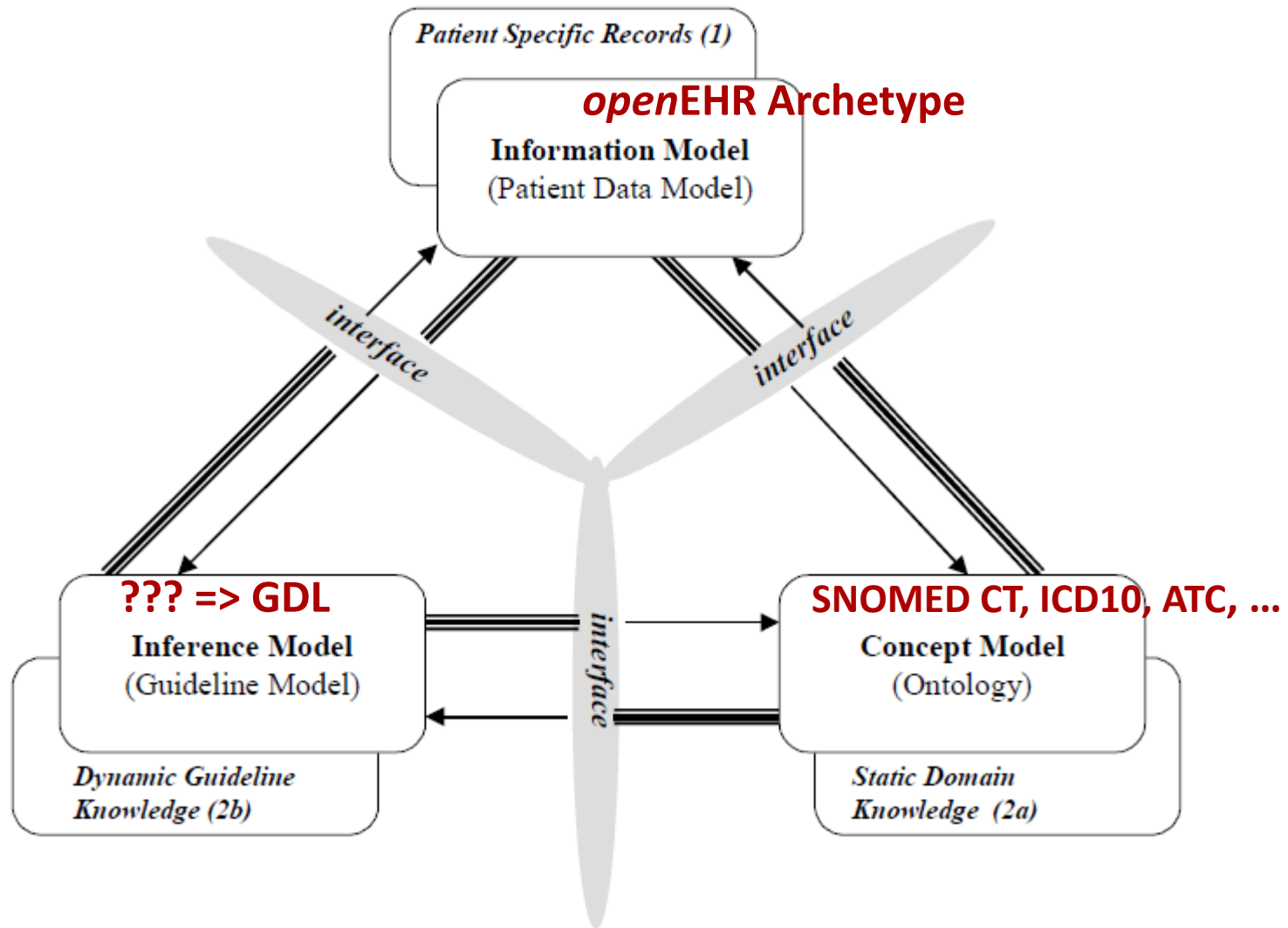


Cambio Healthcare Systems

- Founded in 1993
 - 380 staff across the globe
 - Private and Venture funded
- The leading provider of **Regional EHR solutions** in Scandinavia - presence in Sweden, Denmark, UK, others to follow
- COSMIC is an international standard product
- Close to 95 000 staff users when current projects are fully implemented
- Our solutions are open, scalable and flexible based on *industry standards*
- Cambio invests 150 000 hours annually in COSMIC
- ISO 9001 certification and CE Marked EHR

General requirements

- **Formal language(s) to express clinical logic**
 - Machine readable format, standards-based
- **Agnostic to natural languages**
 - Add/update translations without invalidating logic
- **Agnostic to reference terminologies**
 - Easy to change term bindings
- **EHR model independent**
 - Reuse of common EHR models both for input and output
- **Rules for single decision making**
 - But ready to be combined for more complex decision making
- **Coherent and reusable**
 - For improved reusability and maintainability
- **Rapid development / release cycles**
 - Independent of main EHR product



A L Rector PD Johnson S Tu C Wroe and J Rogers (2001) Interface of inference models with concept and medical record models. in S Quaglini, P Barahona and S Andreassen (eds) *Proc Artificial Intelligence in Medicine Europe (AIME-2001)* Springer:314-323

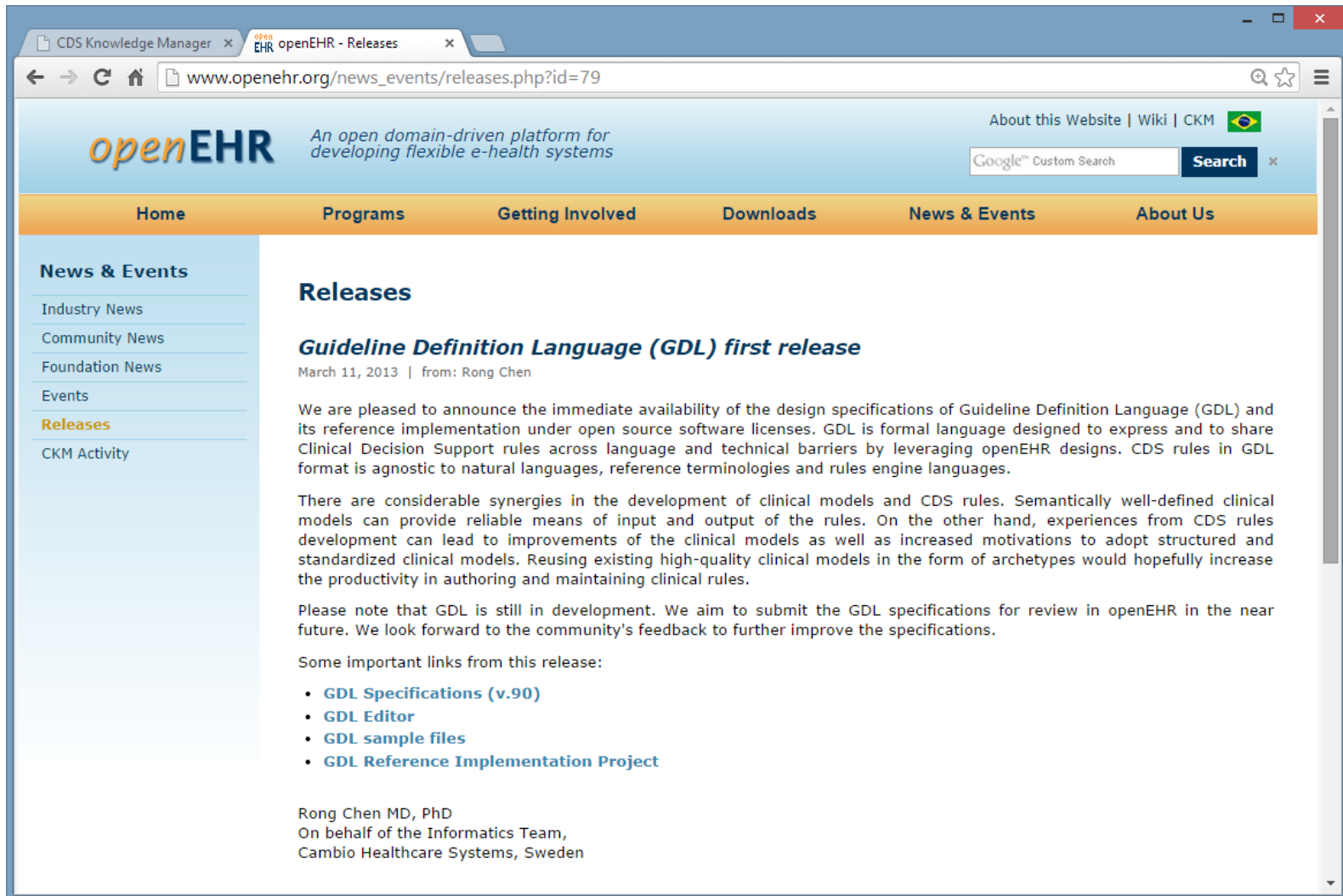
Guideline Definition Language (GDL)

A minimum language to **glue** together
archetypes, terminologies and rules

Three Pillars

- Bindings between archetype elements and variables in the rules
- Rule expressions easily converted to industry rule engine languages
- Bindings between local concepts used in the rules and concepts from reference terminologies

GDL Design Released through *openEHR*



The screenshot shows a web browser window with the URL www.openehr.org/news_events/releases.php?id=79. The page features the openEHR logo and navigation menu. The main content area displays a news release titled "Guideline Definition Language (GDL) first release" dated March 11, 2013, by Rong Chen. The release text discusses the availability of GDL design specifications and its reference implementation under open source licenses. It highlights the benefits of GDL for clinical decision support and the development of clinical models. A list of important links is provided, including GDL Specifications (v.90), GDL Editor, GDL sample files, and GDL Reference Implementation Project. The release is signed by Rong Chen MD, PhD, on behalf of the Informatics Team at Cambio Healthcare Systems, Sweden.

CDS Knowledge Manager x openEHR - Releases x

← → ↻ 🏠 📄 www.openehr.org/news_events/releases.php?id=79 🔍 ☆ ☰

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Releases

Guideline Definition Language (GDL) first release

March 11, 2013 | from: Rong Chen

We are pleased to announce the immediate availability of the design specifications of Guideline Definition Language (GDL) and its reference implementation under open source software licenses. GDL is formal language designed to express and to share Clinical Decision Support rules across language and technical barriers by leveraging openEHR designs. CDS rules in GDL format is agnostic to natural languages, reference terminologies and rules engine languages.

There are considerable synergies in the development of clinical models and CDS rules. Semantically well-defined clinical models can provide reliable means of input and output of the rules. On the other hand, experiences from CDS rules development can lead to improvements of the clinical models as well as increased motivations to adopt structured and standardized clinical models. Reusing existing high-quality clinical models in the form of archetypes would hopefully increase the productivity in authoring and maintaining clinical rules.

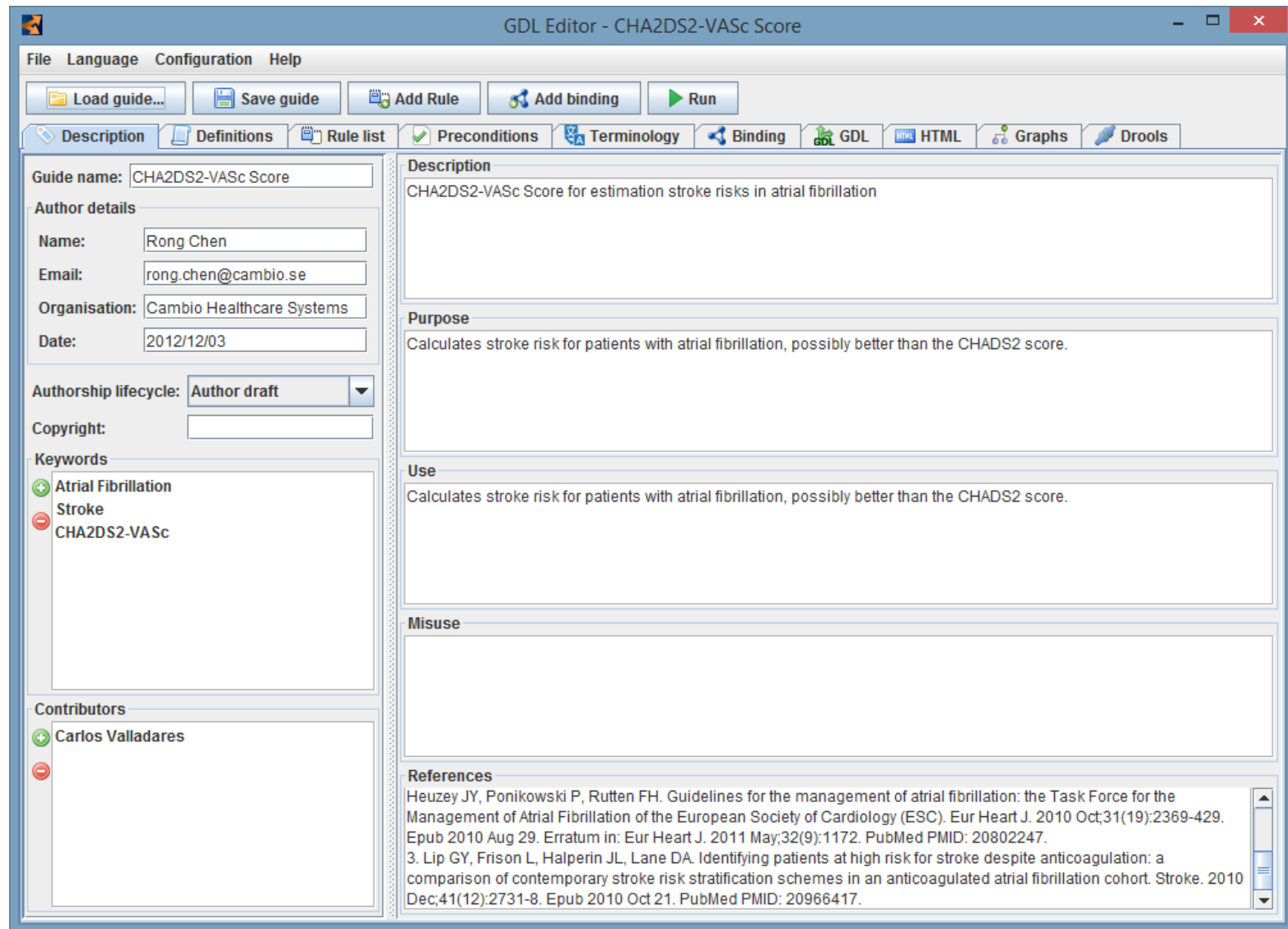
Please note that GDL is still in development. We aim to submit the GDL specifications for review in openEHR in the near future. We look forward to the community's feedback to further improve the specifications.

Some important links from this release:

- [GDL Specifications \(v.90\)](#)
- [GDL Editor](#)
- [GDL sample files](#)
- [GDL Reference Implementation Project](#)

Rong Chen MD, PhD
On behalf of the Informatics Team,
Cambio Healthcare Systems, Sweden

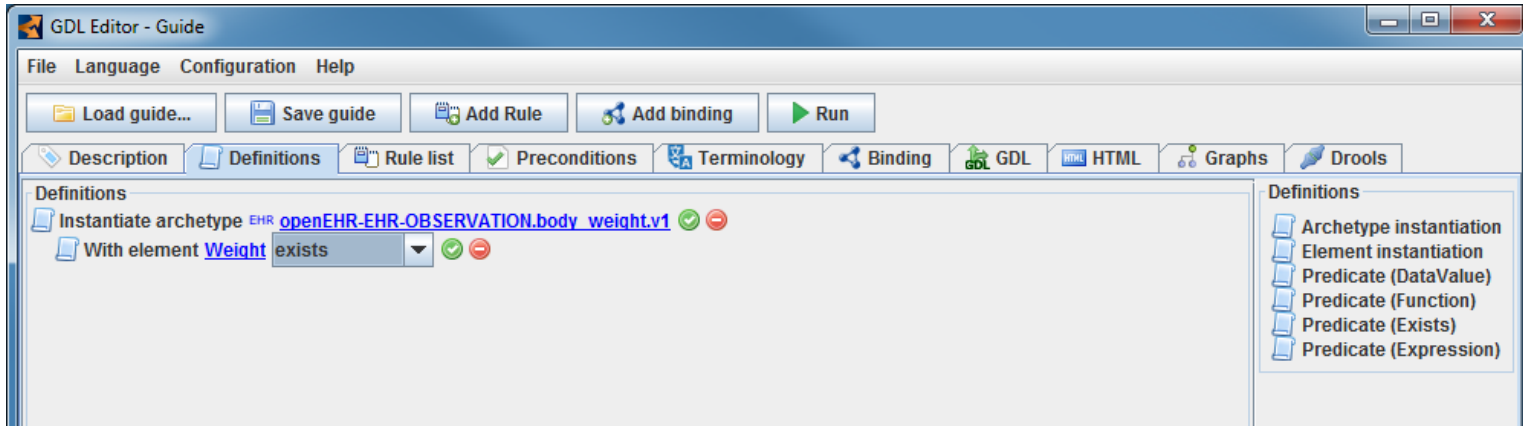
Open Source GDL Ref Impl & Editor



GDL Specs Update: new features

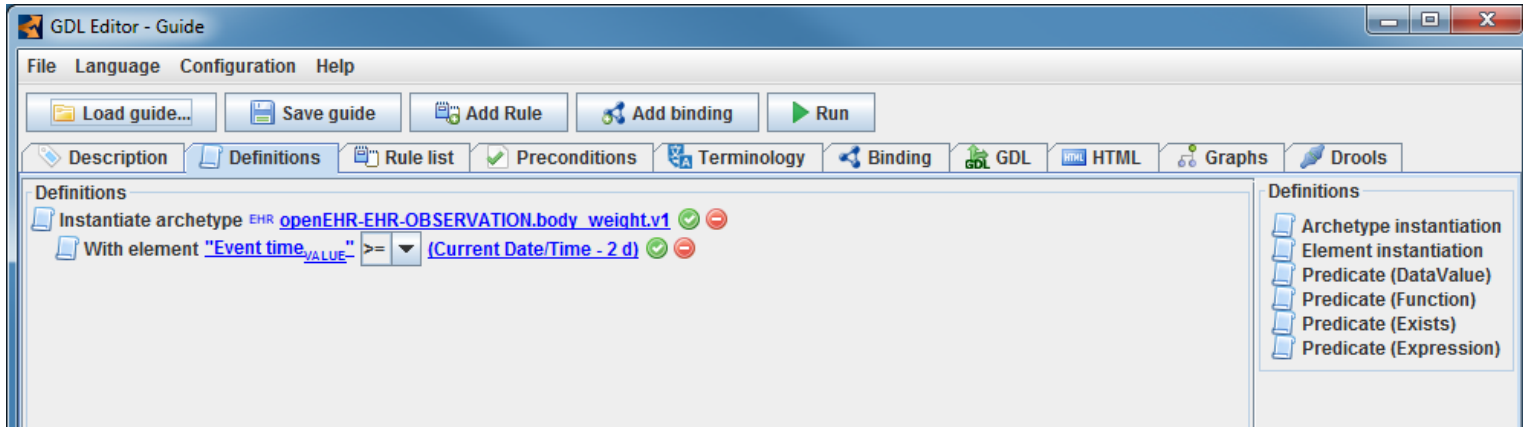
- Predicates (exists and expressions)
- Lists
- Count

New features - Predicates (Exists)



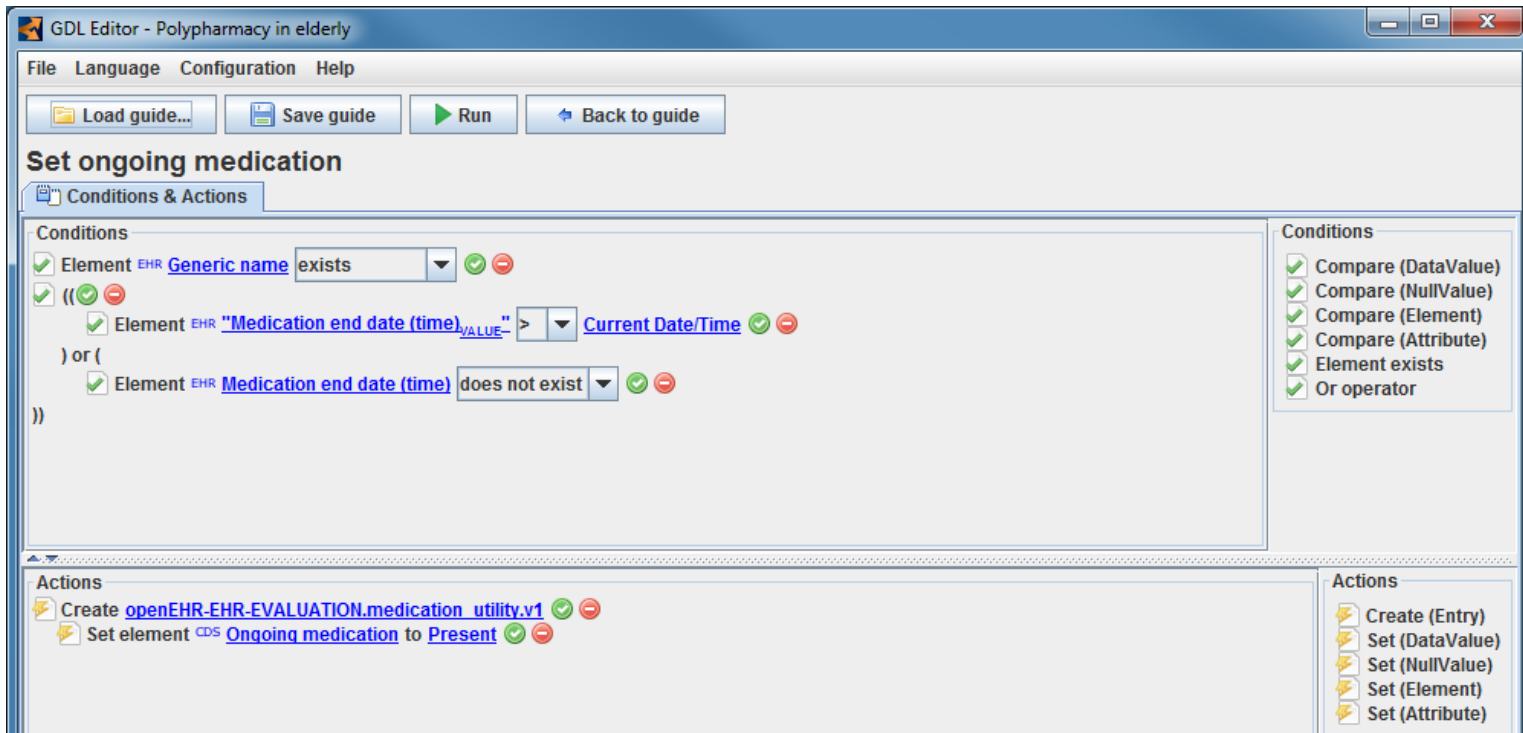
```
["gt0002"] = (ARCHETYPE_BINDING) <
  archetype_id = <"openEHR-EHR-OBSERVATION.body_weight.v1">
  domain = <"EHR">
  predicates = <"/data[at0002]/events[at0003]/data[at0001]/items[at0004]!=null",...>
>
```

New features - Predicates (Expressions)



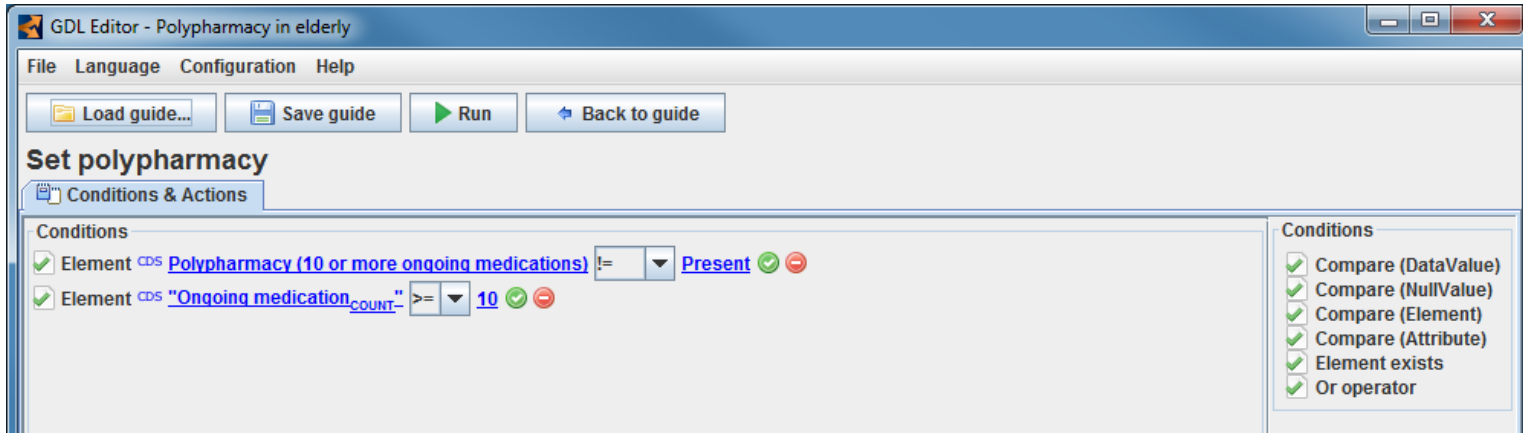
```
["gt0002"] = (ARCHETYPE_BINDING) <
  archetype_id = <"openEHR-EHR-OBSERVATION.body_weight.v1">
  domain = <"EHR">
  predicates = <"/data/events/time/value/value>=($currentDateTime.value-2,d)",...>
>
```

New features - Lists



```
when = <"$gt0019!=null", "($gt0015.value>$currentDateTime.value) || ($gt0015==null)">
then = <"$gt0004.create($gt0005=local::at0004|Present|)",...>
```

New features - Count



when = <"\$gt0003!=local::at0011 | Present | ", "\$gt0005.count>=10">

GDL Specs Roadmap

- Two stable releases per year
 - Both design specifications and ref. implementation (incl. editor)
- Planned features
 - Rule firing as conditions, count()
 - Predicates as default value (CDS domain)
 - Date operations (ISO 8601)
 - Order-sets

CDS Dashboard

CDS Knowledge Manager

CDS Knowledge Manager

Content

- Guidelines
- Archetypes
- Templates
- Terminologies
- Views
- Studies

Guidelines

- HF CPG Treatment
- HF_CPG_Treatment.v1.3
- AF stroke prevention outcome
- AF_stroke_prevention_outcome.v1

Alerts

- Stroke_prevention_alert.v1

BMI in COPD patients

- COPD-BMI_in_COPD_patients.v1

BSA Calculation

- BSA_Calculation.v1

Blood pressure in diabetic patients

- DM4BP_in_diabetic_patients.v1

Body Mass Index calculation

- BMI_Calculation.v1

CHA2DS2-VASc Score

- CHA2DS2VASc_Score_calculation.v1.1
- CHA2DS2-VASc Score
- CHA2DS2VASc_Score_calculation.v1
- CHA2DS2-VASc Score compliance
- Stroke_prevention_compliance_checking_in_AF_alert_mes

Stroke prevention compliance checking in AF active medication: **CHA2DS2-VASc**

Score compliance

GUIDE DETAILS

Description: Compliance to the ESC guidelines for stroke prevention in patients with atrial fibrillation.

Purpose: Estimates the compliance to the ESC guidelines for stroke prevention in patients with atrial fibrillation.

Use: Use to assess if a treatment is compliant to the ESC guidelines in patients with atrial fibrillation.

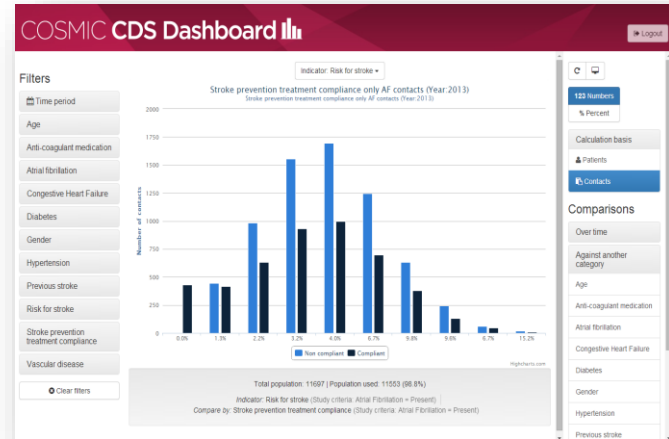
Notes:

References:

- Up D, Newkirk R, Pisters R, Lane DA, Clancy HJ. Refining clinical risk stratification for predicting stroke and thromboembolism in atrial fibrillation using a novel risk factor-based approach: the euro heart survey on atrial fibrillation. *Chest*. 2010 Feb;137(2):263-72. Epub 2009 Sep 17. PubMed PMID: 19762550.
- European Heart Rhythm Association; European Association for Cardio-Thoracic Surgery, Camm AJ, Kirchhof P, Lip GY, Schotten U, Savelbergh G, Ernst S, Van Gelder SE, Al-Attar N, Hindricks G, Prevedel D, Hindricks H, Afilalo O, Angelini A, Harjoto A, Cadedor R, Dic Simara R, Di Sessa A, Goette K, Goronik B, Hatala M, Hohloser SH, Kuck JH, Le Heuzey JY, Piskunovskiy P, Rutten FH. Guidelines for the management of atrial fibrillation: the Task Force for the Management of Atrial Fibrillation of the European Society of Cardiology (ESC). *Eur Heart J*. 2010 Oct;31(19):2398-429. Epub 2010 Aug 25. Erratum in: *Eur Heart J*. 2011 May;32(9):1172. PubMed PMID: 20822247.
- Up D, Filson L, Halperin JL, Lane DA. Identifying patients at high risk for stroke despite anticoagulation: a comparison of contemporary stroke risk stratification schemes in an anticoagulated atrial fibrillation cohort. *Stroke*. 2010 Dec;41(12):2373-8. Epub 2010 Oct 21. PubMed PMID: 20966417.

AUTHOR DETAILS

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 Date: 2013/12/29
 Authorship: lead/author/draft



CDS App

Cambio COSMIC, Måttavla CDSTE-integ. (Måttavla)

CD Nödv. Bostan Zells LA 36. Riggströme Dn. Achilleb. Enner. Oren Mess Agnati. The. Ordre mar. Medical. Order and refers. Connat/Electic View. _Medica. Patient address. [Pat. Anamnäst. F] Websit. EdmatAg. Ebn. Bed. mat.

Hjälpa. | Frensia | 201410520389 | Cdsmedv | Cdsmedv | 69 år

Strokeprevention 201410520389 - Cdsmedv Cdsmedv

Diagnos: **Strokeprevention**

Klinisk bedömning

Förutsättnar: Ja Nej

Hjärtkat/VK-dysfunktion: Ja Nej

Hypertens: Ja Nej

Diabetes: Ja Nej

Tidigare Stroke/TIA: Ja Nej

Vaskulär sjukdom: Ja Nej

CHA2DS2-VASc Poäng

Ris faktorer	Poäng
C Hypertens	1
H Alder > 75	0
D Diabetes	0
S ₂ Tidigare Stroke/TIA	2
V Vaskulär sjukdom	0
A Alder 65-74 år	1
Sc Køn	1
Totalpoäng	4

Rekommendationer

Behandlingen är ej avslutad med Socialstyrelsens riktlinjer för strokeprevention hos patienter med hjärtsjukdom, dec 2015

CHA2DS2-VASc Poäng: 4

Risik för stroke kommande år: **44%**

Rekommenderad behandling baserad på CHA2DS2-VASc: NOAC eller VKA

Antikoaguleringsbehandling föres ej

Referens: Socialstyrelsen. Nödvändiga riktlinjer för hjärtsjukvård 2013. Antikoaguleringsbehandling vid hjärtsjukdom. _Patientsida. version

Ordination

Leta efter mediciner:

CS: Vård rekommenderas (och samordnas) med annan behandling eller medicinsk hjälp för att nå NOAC-pen.

Medicinsk bedömning:

Ta beslut re: Ja Nej

Skript-opp beställ: Ja Nej

Kommentar:

Stroke Prevention CDS - Klinisk Studie

GDL/AQL Discussions

- Specs editing tools, editorial team/process
- Ref impl & tools
- Change requests tracking
- GDL releases linked to openEHR roadmap