# Solution Report

**Team:**

(**note**: while all listed page limits are recommendations, and not absolute restrictions, we do ask that you adhere to them as best you can)

## Part 1: Architecture and use

**Architecture**

Please provide a diagram illustrating the system architecture and briefly explain its components.

*Text/diagram(s) 1 page*

**CIG representation**

Please explain the formalism used to represent CPGs.

*Text/diagram(s) 1 page*

**Domain knowledge representation**

If additional domain knowledge is required, please explain how it is represented. Indicate whether standards (e.g., SNOMED-CT, FHIR, standard domain ontologies) are being utilized.

*Text/diagram(s) ½ page*

**Mode of use**

Please explain the intended mode of use of the system: who are the intended end-users, when is the system to be used: during patient encounter, real-time vs. simulation, etc.

*Text/diagram(s) ½ page*

**Strengths of the approach**

Does the approach have very good support for particular features? Which? Please justify. What is the singular point of strength of your approach?

*Text/diagram(s) ½ page*

Part 2: Features

Section A outlines a set of features that relate to possible interactions among advice offered by CPGs. Section B lists a set of features that relate to possible mitigation strategies for these interactions.

Section C lists other possible features. We include a brief example to illustrate each feature.

For each of the features, please indicate whether it is supported, and, if so, briefly explain how.

### Section A. Interactions among CPGs’ advice

**A1**: Drug from a CPG has an effect on a comorbid condition

*For example, low-dose Aspirin (Cardiovascular Disease CPG) affects Duodenal Ulcer (comorbid condition).*

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

**A2**: Two or more drugs from different CPGs interact

*For example, antibiotics such as Trimethoprim/Sulfamethoxazole impact the anticoagulant effect of Warfarin.*

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

**A3**: Clinical goals from different CPGs conflict

*For example, the goal of preventing thrombosis conflicts with the goal of preventing bleeding during surgery.*

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

**A4**: Conflicting actions (e.g., drugs, procedures) from different CPGs

*For example, one CPG recommends administration of Clopidogrel (Transient Ischemic Attack CPG) while another recommends suspending Clopidogrel (Coronary Artery Bypass Grafting CPG).*

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

**A5**: Duplicate or redundant advice from different CPGs

*For example, Calcium Channel Blockers are recommended in Hypertension and Cardiovascular Disease CPGs.*

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

**A6**: Temporal relationship between different CPGs

*For example, take Cefpodoxime (Acute Otitis Media CPG) two hours after taking antacids (Gastroesophageal Reflux Disease CPG).*

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

**A7**: Multiple interactions from different CPGs interacting at the same time

*For example, adding PPI on top of low-dose Aspirin (Transient Ischemic Attack CPG) to mitigate Duodenal Ulcer (Duodenal Ulcer CPG) impacts new comorbid condition of Osteoporosis (Osteoporosis CPG).*

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

### Section B. Mitigation strategies when CPGs offer interacting advice

A mitigation strategy is an action taken to address one or many of the interactions that were identified above.

**B1**: Adding a drug to mitigate an adverse effect

*For example, add a PPI to mitigate the Duodenal Ulcer due-to Aspirin.*

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

**B2**: Adjust drug dosage

*For example, a reduction of 10% of warfarin dosage.*

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

**B3**: Monitor the effect of a drug

*For example, monitor progression of the Duodenal Ulcer during overlapping treatment with Aspirin.*

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

**B4**: Replacing a drug with a safer / non-interacting drug / more effective drug for comorbidity

*For example, replace Aspirin with Clopidogrel for a patient with Duodenal Ulcer.*

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

**B5**: Discard unsafe/interacting drug

*For example, suspend ACE inhibitor when eGFR value drops by over 30% over 4 months.*

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

**B6**: Delay a task to avoid a temporal overlap

*For example, stop Dabigatran 4 days prior to surgery for a patient with high bleeding risk.*

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

**B7**: Add a task to ensure a temporal overlap

*For example, for a patient with high risk of thromboembolism who is undergoing surgery with a high risk of bleeding, suspending Warfarin 5 days prior a surgery and resuming it one day after the surgery, introduces a 6-day period where the patient is at risk of bleeding; bridge with heparin starting on day 3 prior to surgery till the day of surgery to ensure overlap of the surgery context and the thromboembolism prevention context.*

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

**B8**: Are there any other mitigation strategies for the multimorbidity CPG problem that you have implemented?

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

### Section C. Other features

**C1**: Patient preferences and/or patient burden

*For example, choosing one drug over another due to lower price; or choosing DOACs over warfarin to avoid checking INR on regular basis.*

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

**C2**: Optimization of clinical resources

*For example, grouping tests on the same day.*

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

**C3**: Explanation of the mitigation strategy(ies)

*For example, why a given strategy was identified and what it entails*.

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

**C4**: Alternative mitigation strategies for a single interaction

*For example, if there are more than one possible mitigation strategies, are they identified and presented.*

*Implemented (Y/N)*:

*Brief description*: *text/graphs ¼ page*

## Part 3: Implementation of the Case Studies

Please describe how each of the clinical case studies was implemented.

For each of the case studies, please use the format outlined below when reporting the implementation.

### Input (1 page):

* Show the encoded CIGs required to solve the case in your approach formalism
* Show the encoded patient data
* If applicable, show how adverse interactions (features A1-A7) were encoded a-priori
* If applicable, show/reference the encoding of additional domain knowledge

### Processing (1 page):

* If applicable, explain how relevant interactions were (automatically) identified (features A1-A7)
* Explain how relevant interactions were (automatically) mitigated (features B1-B8 [A8-A14+Other mitigation strategies])
* If applicable, explain how other relevant features were realized (features C1-C4[A15-A18] )
* Explain which parts of the processing are generic and which need to be hardwired for the case[[1]](#footnote-0)

### Output (1 page):

* Show and explain how the result of the processing is represented
* Show and explain what user interactions were involved in the use case
* Explain any additional considerations.

1. There are two aspects: (**1**) processing algorithm: in a generic approach, only models change across case studies, while a hardwired approach requires tweaking the algorithm for each case study; (**2**) domain knowledge: a mitigation strategy can be generic or hardwired: e.g., deriving which drug should replace another drug can come from a knowledge base or be hard-wired for each case study (e.g., based on guidelines). There can be degrees of generality as well, of course. [↑](#footnote-ref-0)