Solution Report Case 4: Drug-eluting stent + Lung mass surgery

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Part 1: Architecture and use

Architecture

Common to all cases

The UJI approach to the management of comorbidities in CIGs uses solely the editing and enacting facilities of the CIG language, in our case PROforma (and its Composer tool). Consequently, no architecture is proposed. Instead, the management of comorbidities is handled by developing specific PROforma fragments that should be considered when jointly using the CIGs of the comorbid conditions. We refer to these fragments as comorbidity management models (CMMs). Note that, for the combined use of the CIGs of the comorbid conditions, a series of adaptations might be required.

CIG representation

Common to all cases

We have represented the CIG in PROforma, using the Composer tool to edit the models. We have designed a CMM to solve the specific scenarios/patient cases proposed (e.g. 76-year old female with TIA and DU in case 1). Note that we have only considered the interactions of the provided scenarios. Moreover, the CMM assumes that all the comorbidities indicated are present. In case additional scenarios are required, the new situations should be modelled as a new CMM to be considered together with the existing one(s).

For a complete solution, it would be necessary to model the CIGs involved and build a final model with such CIGs and the CMMs. This approach is labor intensive since it is necessary to model each possible interaction as a CMM. On the positive side, the interactions will be fully described in the CMM, resulting in self-contained and self-explanatory models.

The descriptions below refer to the elements of the PROforma CIG language. **TODO add paragraph or reference**.

We have followed the following naming conventions. Each time a drug/treatment is prescribed we use a task (usually a plan or an action) with a name beginning with the word “start” followed by the name of the drug/treatment. Each time a drug/treatment needs to be stopped, we have explicitly represented it with a task whose name begins with the word “stop” followed by the name of the drug/treatment. Moreover, if the drug/treatment must be resumed after a period of time, or when the problem is solved, we have also modelled it with a task whose name starts with the word “resume” followed by the name of the drug/treatment. This naming convention helps to realize that there is an action for interaction management and also how it has been solved. In addition, we have associated tasks and data to appropriate SNOMED CT ontology terms.

Apart from that, decisions by the clinician or the patient have been modelled as enquiry tasks. For example, the decision to prescribe or not aspirin will be modelled with a task enquiry_add_aspirin, requesting an answer yes or no from the clinician.

Task preconditions and wait conditions have been fundamental to solve the interactions of the proposed scenarios.

CIG representation

Specific to CASE 4

Here we describe the PROforma CMM to solve the interactions of the Case 4 scenario. In this case we deal with a patient on anti-platelet therapy for less than 12 months and who needs an urgent surgery. The anti-platelet therapy increases the risk of bleeding in the surgery.

The top level plan in PROforma is shown in Figure 1:

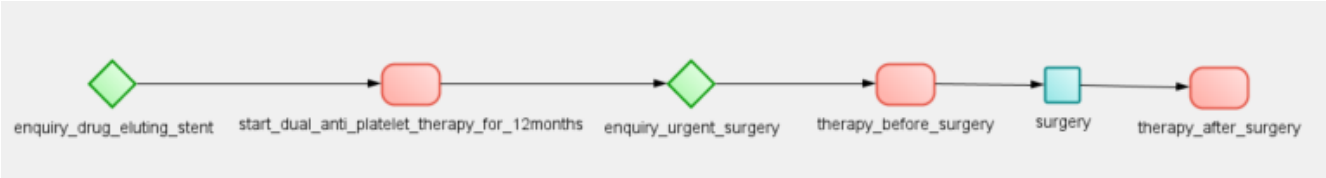

Figure 1: Top-level plan for the management of urgent surgery after a drug eluting stent

In this case, the time is important since the plan applies when there is an urgent surgery before 12 months after a drug-eluting stent procedure. We have used a trigger urgent_surgery_trigger that should be activated to initiate the subsequent enquiry task, which requests the date of the surgery. The plans/actions after that, which model the interactions among the recommendations of both guidelines, have **wait conditions and preconditions** to ensure that these recommendations are performed when required. Figure 2 shows the content of the plan start_dual_anti_platelet_therapy_for_12months, where the therapy with aspirin and clopidogrel starts.

Figure 2: Content of the plan start_dual_anti_platelet_therapy_for_12months

In case of urgent surgery, the plan therapy_before_surgery has the following precondition[1]:

urgent_surgery_before_12months="yes" AND

[1] Note that all PROforma date_diff_ functions work with two dates, to be read in this way: from date to date.

date_diff_months(completed_time(start_dual_anti_platelet_therapy_for_12months), date_of_surgery)<=12

Therefore, this precondition is true if there is an urgent surgery, the patient is on a dual anti-platelet therapy, and this therapy has started less than 12 months before the scheduled date for the surgery.

The content of the plan therapy_before_surgery is shown in Figure 3. The plan stop_clopidogrel_therapy (Figure 3) has the following **wait condition**:

date_diff_days(now(), date_of_surgery)<=5

That is, the clopidogrel therapy is stopped 5 days before the surgery.

Figure 3: Content of the plan therapy_before_surgery

Since the introduction of a bridging therapy is optional, the model asks if this option is required. Then, the action start_tirofiban_therapy has a precondition and a wait condition. The precondition (that must be evaluated when the action is ready for activation) is: bridging_therapy_required="yes". And has a wait condition: date_diff_days(now(), date_of_surgery)<=3. This condition must be met before the action can be activated. Similarly, the action stop_tirofiban_therapy has a wait condition to stop the bridging therapy 4 hours before the surgery.

Finally, the task therapy_after_surgery (in the top-level plan) has also a wait condition: date_diff_hours(date_of_surgery, now()) >=12. Therefore, it will be activated 12 hours after the date of surgery.

Domain knowledge representation

Common to all cases

As mentioned above, we have associated tasks and data to appropriate SNOMED CT ontology terms when possible.

Mode of use

Common to all cases

The system could be used to develop a PROforma-based DSS system. It could be used for simulation but also at the moment of the patient encounter.

Strengths of the approach

Common to all cases

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

- Explainability: Interactions are fully described in the CMM, resulting in self-contained and self-explanatory models
- Ontology binding
- Support for both automated decisions and for decisions by the clinician or the patient

Part 3: Implementation of the Case Studies

N/A.