SHORT TERM SCIENTIFIC MISSION (STSM) – SCIENTIFIC REPORT

The STSM applicant submits this report for approval to the STSM coordinator

Action number: CA15210
STSM title: An analysis of the Spanish KEP and possibilities for future cross-country pools
STSM start and end date: 13/11/2017 to 29/11/2017
Grantee name: Alberto Santini

PURPOSE OF THE STSM/

With this STSM I will visit Prof. Ana Viana at INESC TEC.

We will discuss topics related to the creation of a European patient/donor pool for kidney exchange programmes.

In particular, we will closely examine the Spanish Kidney Exchange Programme (I will start working in Spain in September).

This case is interesting because the donor/patient virtual crossmatch is not performed on a nation-wide basis and the compatibility threshold may differ from one centre to the other.

Therefore patients in different centres may be considered compatible with a larger or smaller set of donors, depending on the centre where the test was performed.

We would like to study the impact this policy has on the number of transplants performed, and on a ad-hoc utility function.

This will also be an exploratory meeting for discussing issues arising with the establishment of a centralised cross-country KEP. In particular, possible managing policies and integration of different national policies.

Short-term research associated to this visit is aligned with Working Package 2. An exploratory discussion on cross-country KEPs will create the grounds for future research aligned with the objectives of Working Package 3.

We plan to use hybrid simulation-optimisation techniques to perform the required scenario analyses.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

We became by reviewing the KEP of many European countries, including Portugal, Spain, Italy, the United Kingdom, the Netherlands, Belgium, nordic countries.

We then reviewed the main approaches to modelling the KEP already existing in the literature.

Together with the models, we also reviewed the solution approaches proposed in the literature, and those actually implemented. We particularly focussed on the heuristic ones, to understand whether or not their usage was really motivated by computational complexity or not.

In particular, we studied the heuristic algorithm used in Spain, and produced an equivalent exact model which can be ran efficiently.

We discussed the problem of modelling arbitrary-length chains initiated by altruistic donors and what are the pros and cons of the methods already proposed in the literature.

We conducted a comparative analysis of the existing KEP models used in different countries, with the aim to understand if some countries could be "clustered" in groups with similar KEP rules and objectives. Countries in the same group would experience minimal friction, were they to merge their national pools into a shared group-pool. We think this could be an intermediate step towards the creation of a unique European pool.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

I have been introduced to the KEP problem, to its main modelling tools, and to the underlying operations that give rise to these models. In particular, I now have a clearer understanding of the complexity of these operations and of the national legislative frameworks within which they have to take place. I also have a clearer undestanding of what the long-term goals of the action are, and of the intermediate steps that can constitute a roadmap towards these goals.

We assessed the feasibility of moving from a heuristic-based to an exact approach to solve the Spanish KEP problem. We have set up a meeting with the Spanish colleagues from the University of Girona to discuss the issue with them, and propose a closer collaboration. The results of this meeting (which will take place next January) can then be further escalated to the point-of-contact of the Spanish National Programme.

We reviewed many different modelling approaches, and their interactions with game theory and simulation, and we analysed their respective strengths and weaknesses.

We started an analysis of the KEP programmes of many European countries, with the aim of producing a standardised comparison table to make it easy to spot similarities and differences among their National Programmes. We took into accounts constraints and objective functions (which mostly represent a "direct mapping" to the country's legislation), and solution approaches.

FUTURE COLLABORATIONS (if applicable)

This action helped me establish two avenues of future collaboration:

- With the colleagues in Porto (Professors Ana Viana, Joao Pedro Pedroso, Xenia Klimentova) working on the KEP, on the analysis of similarities between the european national KEPs.

- With the colleagues in Girona, Spain, on the algorithms used for the Spanish KEP.