

SHORT TERM SCIENTIFIC MISSION (STSM) – SCIENTIFIC REPORT

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

Action number: CA15210 (European Network for Collaboration on Kidney Exchange Programmes)

STSM title: Modelling and optimisation for international kidney exchange programmes

STSM start and end date: 30/09/2018 to 05/10/2018

Grantee name: Péter Biró

PURPOSE OF THE STSM/

From the Hungarian side the visit involved Péter Biró (senior researcher at the Hungarian Academy of Sciences). Alex Popa was the hosts and his PhD student, Radu Stefan Mincu also participated in the collaboration that had started with an STSM to Budapest by Popa and Mincu in April 2018.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

Continuing the research started, we formulated general IP models for international kidney exchange programmes. The novelty of our approach is that we allow the participating countries to have different goals and constraints, just like in one of the existing international cooperation between Austria and Czech Republic. During the previous STSM conducted in Budapest, we studied the possible modelling details, and the standard IP formulations that we will build upon our models. In this visit we extended the theoretical part of our research by describing the exact general models with IP formulations and its variations for special cases. We also discussed the possible settings for the simulations with these IP models on generated data.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

We formulated basic and advanced IP-s for the international kidney exchange problem, where countries can have different constraints and goals. We discussed the plan for extensive simulations. We conducted initial tests using a kidney exchange simulation for a simple two-country setting and we also specified the settings that we will study in further simulations. When studying the benefits of the countries in a cooperation we check the realistic cases when the upper bounds on the length of the exchanges cycles are different in the countries (e.g. 2

in France, 3 in Spain, or 3 in the UK and 4 in the Netherlands). We also study the case when one country (e.g. Spain) has altruistic donors and the other (e.g. France) do not. Finally we study the robustness of these results when the sizes or the compositions of the pools are different in the cooperating countries.

This research topic is directly related to the goal of WG3, in particular to the two goals described in the COST Action proposal: “(ii) propose generic mathematical models for transnational markets; and (iii) propose methodologies to tackle the optimisation problem.”. Our results may well also have practical relevance when solving the international KEPs that are being created across Europe, and in our region in particular.

FUTURE COLLABORATIONS (if applicable)

We are currently writing a 6-page scientific paper to be published in the proceedings of VOCAL 2018, a regional OR conference, and we will also write an extended journal version for a special issue of that conference.