SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

COST Action CA15210 on European Network for Collaboration on Kidney Exchange Programmes: STSM Report
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The purpose of the STSM was to three-fold: 1. To learn firsthand about the state-of-the-art research on multi-country kidney exchange programs, 2. to present my graph theoretic research and discuss ideas on how related theory could be applied to improve the performance of models of kidney exchange programs, 3. to begin an ongoing collaboration based off of the second objective.

All three objective were met during the STSM. A thorough overview of multi-country kidney exchange programs was obtained first through presentations by Prof. Ana Viana and Dr. Xenia Klimentova, and later in the STSM by a day-long meeting in Lisbon with multiple collaborators working on a variety of aspects related to models of kidney exchange programs. Additionally, I discussed my research on algebraic graph theory with Prof. Viana, Dr. Klimentova, and Prof. Joao Pedro Pedroso. Subsequently the idea was obtained to investigate the construction of large kidney exchange networks. More specifically, asking the question of if we can reduce the number cycles to enumerate, and therefore the computational burden, by decreasing the number of edges in highly connected subsets of the network, without effecting the optimal number of transplants. It is hypothesized that this can be achieved via edge sparsification based on the expected in- and out- degree of each patient-donor pair, where the expected in- and out- degree can be calculated relative to the blood type and sensitivity characteristics of each pair. This has increased relevance in the context of multi-country kidney exchange networks as the edge characteristics and network structure will influence the optimal distribution of exchanges within a given country and between multiple countries. Therefore, edge sparsification to reduce computational burden while also meeting country specific requirements on exchanges can also be considered as a second potential project.

Simulations to motivate the proposed research projects, and subsequently confirmation by a theoretical analysis, will be performed at the Technical University of Munich over the course of the next 18 months, with preliminary results expected within 6 months. Collaboration, discussion, and feedback on the project will be continued with Prof. Viana and Dr. Klimentova.