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: **Research visit to Corvinus University and Hungarian Academy of Sciences**
STSM start and end date: **22/09/2019 to 27/09/2019**
Grantee name: **Alexandru Popa**

PURPOSE OF THE STSM

The goal of this STSM is to facilitate the collaboration between the applicant Dr. Alexandru Popa, Associate Professor at the University of Bucharest, and the host Dr. Péter Biró from Corvinus University of Budapest. Together with my PhD student, Radu-Stefan Mincu, who is a Teaching Assistant at the University of Bucharest, we have visited Corvinus University to work with Péter Biró on the topics of reoptimization and quality (quantified as expected graft survival time) in kidney exchange programmes.

We continue our previous collaborations which have resulted in a successful paper on international exchanges “IP Solutions for International Kidney Exchange Programmes”, published in the VOCAL 2018 conference (8th VOCAL Optimization Conference: Advanced Algorithms). The extended version is also presently under journal review at CEJOR.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

We have intensively discussed two important topics in kidney exchange, namely reoptimization in KEPs and quality of transplants. After identifying the key issues and related work, we have begun to tackle reoptimization, while we are waiting for news from several other colleagues regarding KEP quality (the recent STSM between Dr. Péter Biró and Dr. Antonio Nicolo have brought some new ideas and developments).

DESCRIPTION OF THE MAIN RESULTS OBTAINED

1. With regard to KEP reoptimization, we have realized the importance of several aspects. Reoptimization in KEPs refers to the procedure of doing the computational mathematical optimization step (where the transplant cycles are identified) several times per stage (where a stage is every 3-4 months). After optimization is conducted, a crossmatch test is performed, ensuring that the patients and donors that were believed to be compatible based on the virtual crossmatch test (based on ABO compatibility and HLA compatibility) are indeed compatible. After this step, some of the planned transplants must be rejected because of the newly detected donor-

patient incompatibility. Because optimization is relatively cheap and testing donor-patient pairs is expensive, the goal of reoptimization is to plan tests in order to maximize the expected number of performable transplants. We wish to demonstrate with computational simulation the difference between the various strategies and scenarios for reoptimization. The simulations should consider a time frame of several years to better understand long term effects.

2. Looking at the topic of KEP quality, we have also identified some research directions. Quality regarding kidney exchange is difficult to define, as each transplant has unique characteristics. In previous related work, there have been efforts to express graft survival time using statistical models based on the previous transplant data over several years. Traditionally, the objective of optimization in nearly all KEPs is maximizing the number of transplants (or the number of expected transplants) sometimes with extra priority given to highly sensitized patients that are difficult to match. We aim to describe the effects of implementing maximizing graft survival time as an optimization objective and analysing the benefits /drawbacks from this choice. The methods will be similar to the above, computational KEP simulation involving real / generated data of participants arriving in a time frame of several years.

FUTURE COLLABORATIONS (if applicable)

We wish to continue our collaboration and also involve other parties such as Antonio Nicolo from Italy and our colleagues from Porto (led by Ana Viana). We have discussed to use some Italian data for our work, but it is in the process of digitization.

We believe the two issues we consider are extremely important and we will continue to study them. Reoptimization has the potential to increase the number of transplants conducted at each KEP stage, while the topic of quality is the primary concern of all KEP participants.