Optimizing Mobile Blood Collection Logistics with a Computational Tool

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In countries with an unpaid and voluntary blood donation system, most donations are collected in blood drives arranged by mobile blood collection units. Optimizing the utilization of these units is a labor intensive task and manual planning often has suboptimal results. I designed and implemented a program which optimizes where, how often, and how much blood should be collected annually in each region of the target country. These optimizations increase the availability and decrease the cost of life-saving blood products. I introduced a regression model for estimating the number of donors attending a target location based on population distribution data and the frequency of nearby blood drives. Based on this model I developed an algorithm which generates efficient blood collection plans based on statistics from previous years, transportation costs, team configurations, and a list of available target locations and their possible rents. In order to enable efficient data analysis, I created a map-based graphical user interface which can be used to compare generated plans and the cost-efficiency of different target locations. The program was used to generate optimized blood collection plans for Finland with promising results. It was estimated that using the tool the annual logistics costs could be decreased from 1.78 million to 1.66 million euros and three man-years worth of time could be saved in annual planning. The program was also used to compare the impact different parameters, such as the cost of fuel, have on the optimal blood drive locations and the overall cost of the operation. Previously such results would have taken months to calculate. Many countries share a similar mobile blood collection system and could also benefit from the implemented tool.

Awards Won:

Second Award of $2,000