**PLASMA DONOR APPLICTION**

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PLASMA DONOR APPLICTION

The necessity of blood has become a significant concern in the present context all over the world. Due to a shortage of blood, people couldn’t save themselves or their friends and family members. A bag of blood can save a precious life. Statistics show that a tremendous amount of blood is needed yearly because of major operations, road accidents, blood disorders, including Anemia, Hemophilia, and acute viral infections like Dengue, etc. Approximately 85 million people require single or multiple blood transfusions for treatment. Voluntary blood donors per 1,000 population of some countries are quite promising, such as Switzerland (113/1,000), Japan (70/1,000), while others have an unsatisfying result like India has 4/1,000, and Bangladesh has 5/1000. Recently a life-threatening virus, COVID-19, spreading throughout the globe, which is more vulnerable for older people and those with pre-existing medical conditions. For them, plasma is needed to recover their illness. Our Purpose is to build a platform with clustering algorithms which will jointly help to provide the quickest solution to find blood or plasma donor. Closest blood or plasma donors of the same group in a particular area can be explored within less time and more efficiently.

The United States’ blood supply chain is experiencing market decline due to recent innovations in surgical practice, transfusion management, and hospital policy. These innovations strain US blood centers, resulting in cuts to surge capacities, consolidation, and reduced funding for research and outreach programs. In this study, we use data from a regional blood center to explore the application of contemporary machine learning algorithms for modeling donor retention. Such predictive models of donor retention can be used to design more cost effective donor outreach programs. Using data from a large US blood center paired with random forest classifiers, we are able to build a model of donor retention with a Mathews correlation of coefficient of 0.851.

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The human body attacked by a virus produces proteins called antibodies in the blood to defend. These antibodies would stay in the blood for a certain period, fighting off the same virus if exposed to it again. The CP therapy can be briefed as a person who got recovered from a given virus (convalescent phase) will have enough antibodies that can be extracted and transfused into patients fighting the same disease. These antibodies would help the recipient’s immune system to accelerate developing its antibodies. Hence, this therapy is called passive immunity.

Human blood constitutes 45% of blood cells (Red blood cells, white blood cells, and platelets) and 55 % of plasma. Plasma is the liquid yellowish part of the blood that contains the antibodies. The process of separating plasma from the blood is called Plasmapheresis. The process takes around two hours. Unlike the typical blood donation, plasma donation is a closed-loop system. The plasma is drawn from the donor into a machine using a centrifuge and then the plasma is separated from the blood. After collecting enough plasma, the blood returns to the body of the donor. The plasma would undergo many tests for identifying transmittable diseases before it gets transfused to an ill patient.

CP therapy can be traced back more than a century. It had been in use in past disease outbreaks like SARS, H1N1, H1N5, Ebola, etc. The studies show a statistically significant reduction in mortality rate, and the recovery was faster compared to nontherapy patients. Infusing a person with another one’s plasma has some risk factors like uncertain rejections and allergic reactions that can lead to Multi-organ failure. That explains why Plasma Therapy is used only for critically ill patients with a lesser chance of survival. Hence, Plasma Therapy is the best option when no treatments are available.

A potential donor with consent can approach any of the plasma donation centers if he fulfills the eligibility criteria like (1) history of confirmed COVID positive test result (2) age between [18-55] (3) being symptomless for at least last 14 days etc. The donor will go through a screening process during which he gets inquired about his/her health history. Plasma donation selection criteria can be slightly modified according to local requirements and standards but should be in line with the World Health Organization (WHO) guidelines. Those who have fulfilled the initial criteria have to go through screening tests like (1) Antibody testing – to determine whether antibodies exist or not (2) Antibody titer test – to determine the presence and the antibody concentration in the body. The threshold antibody level for donation varies slightly in different countries.

In the initial period of the outbreak, there was no proper channel for inviting plasma donors. As the cases went high, the demand for plasma grew, and very few recovered patients were willing to donate. There were cases where the health authorities could not arrange a donor and hence the family was encouraged to do the job. People were in a desperate chase, trying every possible way to locate a donor. Even after finding a donor, chances are there for the donor to fail any of the eligibility criteria or not to have a threshold antibody level. Since, Plasma therapy is done only for critically ill patients, the above scenario can create stress and panic. An appropriate and efficient method is necessary for not just finding donors but the most efficient one. Studies and research show that the level of antibodies is influenced by many donor-related factors, such as the severity of the disease, age, and many more. It is not easy to set a rule-based system for the prediction of antibody level. Hence, the best and feasible way is to use data-driven methods.

The contribution of this research can be summarized as follows:

An effort to mimic the data of plasma donors as the donor’s clinical history data is not publicly available.

Predict whether a person is Eligible for Plasma donation with a threshold antibody titer using ML Classification Algorithms.

Predict the antibody titer/level value of donor using ML Regression Algorithms to discover the person with a higher level of antibody.

Analyze different Classification and Regression algorithm results in the account of the donor selection task.

Agile methodology is a routine used for the development of the project which supports the respond to the volatility of building software through incremental, iterative work pace. A mobile application is developed using agile techniques. In this paper, a new and productive approach is proposed to solve the problem of blood bank management using UML and XP techniques. Just with simple touch donor will be requested to enter a person's details like name, telephone number, age, weight, date of birth, blood bunch, and address. At the time of emergency, information regarding donor can be checked using GPS nearby. Once the application is invoked, the user can enter the blood group which they require, it will show the donor details nearby and send an alarm message to the user. If the donor agrees for the request an OTP is sent for the verification process. If in case the donor rejects the request the next donor is automatically searched. Once the donor gives the blood it will remove the donor detail for next a quarter of a year.

PROBLEM STATEMENT:

During COVID 19 crisis the requirement for plasma increased drastically as there were no vaccinations found in order to treat the infected patients. In such situation it was very difficult to find the plasma donor, check whether the donor was infected previously and was recovered, and which donor is eligible to donate plasma was a challenging task. As the plasma therapy was one of the ways to treat the infected patients getting the donor details played a major role.

Convalescent Plasma Therapy: Data Driven Approach For Finding the Best Plasma Donor

Convalescent Plasma Therapy is an investigational therapeutic method recommended as a treatment strategy for COVID- 19 as vaccines, and proper treatment methods were unavailable. The therapy involves transfusing antibody contained plasma from the COVID recovered individuals (donors) into critically affected patients. It can accelerate the recovery of the recipient. The effectiveness of antibodies is affected by the health and clinical history of donors, according to research. It implies the possibility of implementing Machine Learning Classification models for predicting the Eligible donors (who meet the threshold antibody level for donation) and Regression models to predict the antibody level value of a donor from the person's clinical history before conducting tests for the same. The proposed system can help the health authorities approach the most probably efficient donors for the therapy rather than wasting time and test kits on a random donor who may or may not be eligible. The results from various ML algorithms trained on a synthetic clinical history dataset are examined and assessed as significant to some degree. The system has to be validated against real data to arrive at reasonable conclusions. This paper demonstrates how a data-driven solution is more beneficial than the conventional methods for donor search.

The blood donation process is an incredibly safe medical practice. Still, beliefs, attitudes of people, and their level of awareness may affect it. In order to measure the level of awareness and knowledge among the people, a real-time cross-sectional study was organized at ‘King Abdulaziz Medical City’ (KAMC). This was also done to detect the problems in the whole process of blood donation. The key problems reported for not donating blood were that donating blood did not cross their mind (32.4%) followed up with ‘No time available in schedule for donation’ which added up to around 45%. Finally, the main reason being the difficulty in accessing the blood donation center which encompasses 61.3%. This is due to unawareness in the society regarding the blood donation process. Sound data-driven machine learning techniques can be used for predicting donations and supply needs which in turn can improve the entire supply chain.

Demand for plasma-derived therapies is increasing, which drives an increase in the demand for plasma for fractionation. This is the case despite the existence of recombinant and other alternatives. Not all conditions have alternatives to plasma-derived therapies and patients differ in their need for treatment. This explains the co-existence of plasma-derived and other therapies.

The protein which requires the largest amount of plasma based on the patient needs and how much of this protein plasma contains, is the key in determining the demand for plasma. Today, the protein with the highest demand is immunoglobulin. Hence, immunoglobulin has to bear a large share of raw material costs.

The production process of plasma-derived therapies is much longer and more expensive than production of traditional pharmaceuticals. Production of plasma-derived therapies can require 7-12 months from donation to delivery of the therapy to patients, compared with around 2-3 months for traditional pharmaceuticals. Furthermore, raw material costs are the primary cost component for plasma-derived therapies, while for traditional pharmaceuticals the largest cost component is sales and marketing.

The large share of the total costs from raw materials lowers the flexibility for developers and manufacturers of plasma-derived therapies in setting prices. This is especially true for immunoglobulin, which has to bear a large share of the raw material costs. Hence, tender specifications and pricing can have large effects on ability to supply. There are examples of tendering practices leading to therapy shortages (e.g. the UK and Romania).

The plasma-derived therapies industry supports the European economy through direct, indirect, and induced effects. The direct economic effects relate to production within the plasma-derived therapies industry. The indirect effects estimate the value created by sub-contractors to the plasma-derived therapies industry, e.g. at plasma collection centres, cleaning companies, or IT solution providers. The induced effects represent the value created when employees, both in the industry and its sub-contractors, spend their income. Our indicative analysis suggests that the order of magnitude of these types of impact could be 9.7 billion EUR.

The spending of donor compensation supports an estimated 76 million EUR per year of the induced effect and 1,100 full-time equivalent jobs from compensations to plasma donors in Germany, Austria, the Czech Republic, and Hungary.

Plasma donation centres can themselves have positive effects on the local community through a number of different channels such as employing staff, using local contractors, employees spending their income, collaborative partnerships, and by being a gathering point in the local community.

CONCLUSION:

Plasma is a liquid portion of blood; it is a mixture of water, proteins and salts. Antibodies are proteins made by the body in response to an infection. People fully rescued from COVID19 are encouraged to donate plasma, which can help to increase the lifespan of other patients becausetheir plasma contains antigens which helps the affected person to recover faster. These immunoglobulin give your immune system a way to fight the virus when you are sick, so your plasma can be used to help others fight off illness. Individuals must fully resolve symptoms for at least 14 days prior are eligible to donate.

FUTURE ENHANCEMENTS:

Upgrading the UI that is more user-friendly which will help many users to access the website and also ensures that many plasma donors can be added into the community. Using elastic load balancer, it helps to handle multiple requests at the same time which will maintain the uptime of the website with negligible downtime.