



Management of Blood in the Context of Supply Chain Network



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Submission: 📅 November 15, 2018; Published: 📅 January 03, 2019

Abstract

Blood supply chain network design is an approach in a context for management of blood such that considers all of the main factors related to management of blood from donation to the final consumption. Uncertain nature of donation and demand for blood, perishability of blood products, blood collection centers, and the different echelons of blood supply chain are the properties and factors that have a straight effect on the management of blood. This study tries to review these main factors for suitable management of blood.

Introduction

Correct management of blood as a resource that the life of human being is depended on it is very important. The special properties of blood have caused the attention of engineering and management researchers for finding suitable approaches in order to enhance the management processes of blood [1]. Uncertain supply of blood by donors, uncertain demand for blood, high perishability of blood products, and high dependency of life of human being to this resource, are among the special properties of this scarce resource [2,3]. In order to deliver the blood to a needy person in the right quality, right amount, and the right time, these special properties must be managed correctly that different factors are effective and involved in this context. One of this factor are donors of blood that the blood must be received from them. Another one of factors are centers that collect blood from the donors. The blood laboratories and blood production centers are other factors of this chain that the required experiments are done and different types of blood products like red blood cells, platelet, plasma are produced in these centers [4,5]. With considering the interaction of this factors on each other, many researchers have considered the subject of management of blood in the context of supply chain management [6].

Supply chain management is related to management of a flow of goods and services including material and final products through different echelons that the final goal is to deliver the final product to the end user in right quality, right quantity, right time, and right location [7,8]. In the field of blood supply chain network design, blood donors, blood collection centers, laboratories, and blood production centers, blood holding centers, hospital and consumption centers and finally the needy persons are the echelons

of the blood supply chain [9]. Considering the effect of each of these echelons on the correct function of the blood supply chain and its management, and also the special properties of blood in the management of this important resource, this factors and properties are surveyed in the following.

Uncertainty in Supply and Demand

Donors of the blood supply chain are one of the main elements of this chain and if they don't donate the blood, the other parts of the blood supply chain become idle. As the donors optionally donate their blood, the uncertainty in this echelon is high. Also, in many cases like natural and man-made disasters, the demand for blood becomes more than normal situations and this means that the demand for blood is also uncertain. For this reason, researchers have adopted some types of methods to deal with this type of uncertainty in the blood supply chain. Stochastic programming, Robust Optimization, possibilistic programming, are the main adopted methods in this regard [10-12].

Blood Collection

In overall, three types of facilities have proposed for the collection of blood from the donors. The first one is permanent blood centers that are fixed buildings for the collection of blood and the donors are forced to go to this permanent center to donate their blood. These type of blood centers are not accessible for all of the donors. The second types of facilities are mobile blood centers that don't have a specific and permanent location (like a bus or coach) and are changed in every period and even can change their location more than one time in every period. The third type of facilities for collection of blood is demountable collection units that are

proposed for using in villages, town, and islands that the amount of population is small for construction of the main blood center. In this type of facilities, all of the equipment is transported in the intended location by a truck and are unloaded in an existing building and are remained there for a period [13-15].

Type of Blood Product and Perishability

As different types of blood products are produced from a whole blood with different amount of shelf life for each of them, this matter is very important. There are different types of studies in this regard including studies with one type of blood product without considering their perishability, studies with one type of blood product and with considering their perishability, studies with more than type of blood product without considering their perishability, and studies with more than type of blood product with considering their perishability [16-19].

Type of Solution Method

In order to solve the blood supply chain problems, different types of solution approaches have adopted in the studies of researchers that Operation research, simulation and statistical analysis are the main used categories in between [20,21].

Type of Supply Chain Level

As mentioned, a blood supply chain network contains different echelons that each of them has its special effect on the function of the chain. Some of the research in the field of blood supply chain, only considered and put their focus on one echelon of blood supply chain, some others have considered more than one echelon (but not all of the echelons) and finally some of the researches have considered the effect of all echelons of the blood supply chain network in their studies [22,23].

Internet Technology for Blood Supply Chain

Nowadays, the internet technology has become a popular and useful tool in many sectors. This technology can have a significant role to improve the performance of different echelons of blood supply chain networks and their synergy with each other. There are studies such as the use of RFID and Internet of Things in this regard [24,25].

Conclusion

In designing the blood supply chain networks, all of the effective echelons of the chain must be considered in order to properly manage the different processes related to the blood. Uncertainty in supply and demand for blood, considering the blood products and their shelf life, adopting suitable policies for collection of blood, are also the other important matters that without considering them, correct management of the blood supply chain is not possible.

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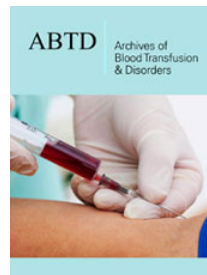
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