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Business

Collaboration in Blood Banks in Saudi Arabia

Literature Review (Continued)

It is essential to monitor the blood supply chain not only in Saudi Arabia, but everywhere, by way of facilitating continuous and detailed red cell data collection of materials and blood stock as also of wastage data which are submitted to a web based data management facility to enable continuous and detailed data extraction results. The Blood Council of Saudi Arabia must evolve a data management system that enables review of performance in regard to stock levels and red cell wastage. The conclusions from such a system should reveal the development of an innovative web based data management system which facilitates collection of data and the benchmarking of ideal practices, that should further bring positive changes in the practice of stock management, thus resulting in optimum use of the donated blood. Management and logistics of blood and blood products are operations that are critical in ensuring that blood supply levels meet the critical needs for all situations and contingencies. Hence this process must be transformed into an efficient and proactive system.

A key factor to improve the system is by first establishing integrity of blood supply data, and ensuring that such data is incorporated in the system, is valid and consistent. Innovative web based techniques have to be used to collect blood data and put into the Blood Council’s centralized data base. Template and file based data integrity mechanisms have to be used so that the entered data is correct and valid without duplication of other sources and that such data collection can be extended to relate with data of other agencies like Red Cross and other reputed NGOs. This however is only the

first step and data mining and technologies must be based on knowledge analysis that includes resolution abilities and problem identification so as to improve the management of blood supply. This way inventory management can be substantially improved with the use of data that can locate and differentiate between excess and short inventories in blood collection centers (Turgeon 2004). Consumption and inventory patterns can be analyzed at regional and service levels and indicators of performance and metrics can monitor the scale of consumption of blood and blood products so that such patterns can be established and proactive action taken to bring about improvement and efficiency. Data mining and techniques of analysis are also used for predictive logistics and forecasting and management of emergency response.

To improve blood supply chain management, and in view to use the scarce quantity of available blood more efficiently, often computer simulation is helpful as an instrument to increase efficiency in the blood supply chain management. The design and methodology approach is an application of simulation modeling that is used in services concerning blood transfusion. Based on simulation experiments blood supply chain can be influenced since it enables quick decisions in regard to allocation of scarce resources thus resulting in better quality ofhealthcare for all.

In recent years in view of the increasing cost of medical care and treatment, the efficient and proper use of medical and health facilities has taken priority and there have been hectic efforts to contain the cost of hospital and transfusion services, in addition to improving the techniques and qualities of health and patient care (Spens 2001). With increasing demand for blood and

blood products, the cost for the same is increasing consistently in the face of demand to increase the quality and safety of available blood (Hillyer 2003). With this trend there is a rise in surgical activity and advanced means of treatment, and hence there have to be new approaches devised to increase the utility of blood acquired. In the late 1970s and early 1980s several studies in varied forms and in different countries were pursued to devise blood related innovations (Brodheim and Prastacos, 1979, Kendall, 1984, Sapountzis, 1984, Prastacos, 1984, Pierskalla and Roach, 1972).

The blood supply system is such that the collected blood by way of donations moves from the initial donation towards its final use by way of collection, testing, and processing until it is used by hospitals and health centers for operation theatres and patients. Since transportation and storage has to be done at all stages, the entire process is very delicate and needs caution and expertise to make full utility of the products. Blood comprises of many components such as red cells and white cells of different kinds, plasma and platelets, which are extracted from the collected blood. Red cells are primarily useful for accident patients and for surgical use in addition to use by infants and anemic people. While platelets are helpful for treating cancer patients and accident victims in case of excess blood loss, frozen plasma is used for patients with liver complications and for burns injuries. Other models of blood supply have also been brought about (Custer, 2004, Pierskalla, 2004) that are different to the normal analytical modeling approaches which have been used so far by theorists. Such simulation techniques are useful tools in making cost effectiveness analysis related with different health care problems (Taylor and Kuljis, 1998). As per Pidd (1996),

computer simulation is primarily a basis for experimentation and exploration, and according to Bateman (1997), it is a means to experiment with detailed models of real systems to ascertain how systems respond to changes in their structure, environmentand under other assumptions. This system has several advantages over the other conventional systems and is therefore used in design and decision making in industries and blood supply chain management (Saayman and Bekker, 1999).

Just as limited resources have to be used prudently in manufacturing and industry, in the health care sector also, there is need to use the available resources in a way so as to extract maximum utility, which implies that simulation techniques are the best applications in health care systems throughout the world. Often it is the timely availability of blood that is the most important issue when there is a question of life and death to a patient. There is no scope and room to conduct trial and error experiments in regard to blood supply chain management and instead, other alternatives have to be employed to ascertain consequences of using different inventory controls and production and transport models. The greatest benefit of using computer simulation is that decisions become less risky in regard to changes in the system, which is based on knowledge created by such experiments. Since models are simplifications and there can be no assurance that they will always be valid, they must be used in a sensible way so that modeling approaches provide useful tools for managing risks and uncertainty factors. It is for this reason that Pidd (1996) commented that models are tools for thinking, which can be used for adding leverage to human thoughts and for analyzing them. The main aim of this study is to find ways and means to

improve the supply chain management for blood and blood products, since it is essential to use the scarce availability of blood more prudently and efficiently.

In the arena of health care, simulation has already been established as an important means for improving performance in operation theatres as also in enabling lesser waiting time for patients. For management of blood supply, discreet simulation techniques are recommended to improvecommunicationand reduction in time taken to market the product in addition to providing flexibility in the product mix and volumes. This has often resulted in fresh blood being supplied and in optimum inventory control, while there are no overlapping functions thus resulting in lesser costs and improved availability of blood (Goldman 2007). However there are some shortcomings in this approach in that simulation takes considerable time and requires specific expertise that is not always available on call. A thorough knowledge of the entire process is essential, failing which the technique cannot be used. The modeling approach requires that the one who is modeling should understand and be able to reason about the factual position in the real system, as also have full knowledge about simulation practice in order to take the right decisions which are critical in context of the details, scope and other issues related to modeling. A thorough knowledge of statistics is essential to judge random variance and to interpret and understand the results correctly (Steele 2008). There is also need to have software skills so as to construct models effectively. In such models there is an additional task of conducting a sensitivity analysis to better

understand the process and to make more effective use of the dynamics of the blood supply chain.

In the context of this research it is relevant to understand how blood organizations work and go about their job of educating, recruiting and retaining blood donors as also how they collect, store and distribute the collected blood. Their main role relates to mobilizing people and groups for blood donation and to organize blood donation camps in schools and work places as also to give blood donation presentations at such places. They have to also provide pre and post donation counseling to donors and ensure their welfare. Blood organizations must maintain effective and harmonious communication amongst team members and ensure a cordial working atmosphere. Personal and people development must be of a high order and performance of staff must be monitored against predetermined objectives and standards. In this regard there are other incentives also that employers provide, which may be in the form of grant of leave in token of the blood donation. Donors are also given priority during periods when there is shortage of blood, in addition to lucky prize draws for them and rewards for those who organize successful blood donation campaigns. Most of the blood donors do not donate for receiving any payment or reward and the prime consideration in this regard is their sense of duty.

Appropriate research must be a continuous process by way of surveys and audits that must include information collected from logs maintained in regard to all staff and work related issues. All blood transfusion units must comply with health and safety procedures, guidelines and protocols in all facilities and ensure that there are no accidents and instances of failing and

defective equipment within the facilities (Wiltbank 2008). They have to adhere to all quality assurance policy guidelines and instructions as also to keep up with developments in quality that are relevant to the area of work and services. The codes of ethics and codes of conduct have to be complied with along with the disciplinary procedures as laid down for such organizations.

The blood collected is usually stored as separate components, and some of these have short shelf lives. Presently there is no solution or well defined procedure that can facilitate storing of platelets for a long period, though continous efforts are on to find a break through in this regard. The longest known shelf life known in this context is seven days. Red blood cells, which are the most frequently used components, have a larger shelf life of 35 to 40 days in cold storage which can be further extended by freezing with a mixture of glycerol but this process is very expensive and requires extremely cold temperatures for storage, hence is rarely adopted. In contrast plasma can be stored in a frozen state for a longer duration and is normally given an expiry date of one year and maintaining a supply for the same is less complicated. In view of the very less storage time it is difficult to maintain a stock of blood to prepare for a disaster due to the little storage time available. This matter was the subject of discussion at several forums after the September 11th attacks in the United States, and the overall consensus was that collecting blood during a disaster was impractical and that efforts should be focused on maintaining an adequate flow of supply at all times. It has been the experience that blood banks in the U. S. have difficulty maintaining consistent supply of blood for routine transfusion requirements.

It is primarily due to these circumstances that the role of blood banks and effective coordination amongst them is of vital importance in justifying their existance as agencies entrusted with life saving tasks for the welfare of humanity.

In 1997 The World Health Organization directed that professional blood donations should be discouraged and should come only from voluntary donors who have no motive to gain financially from such acts, but upto 2006, there were 49 countries only that had started such a practice out of the 124 countries that were made a part of the research study in this regard. However there are still several countries that continue to depend on professional donors for their requirement of blood supplies. There are several countries that rely on paid donors to maintain an adequate supply of blood and blood products, but some countries have made improvements and achieved higher standards. For Tanzania, data shows that 20 percent of donors in 2005 were unpaid donors while in 2007 they comprised of 80 percent of the donors. The WHO, which conducted a survey for 124 countries in the same year found that 68 of the countries had made insignificant progress in this regard. In countries such as Brazil, receiving monetary gain for donation of blood is not supported and is considered.

Sometimes patients who may be having iron overload, blood donation by them prevents the accumulation of toxic quantities and in this context blood banks in the United States have to label blood that is from donors who are under medication and blood banks do not receive the blood donation if the donor suffers from any disease. In other countries, such as the Australian Red Cross Blood Service, blood has been accepted from donors who suffer

from minor ailments. Research has indicated that blood donation reduces the risk of heart problems, but the this has not been fully established.

Blood products have to be provided by blood banks and hospital transfusion services after blood is collected from collection centers that may be then distributed in several parts of the country, which is transported by mobile collection units that travel to collect the blood from centers around the country. Provision has to be made for blood processing laboratories and testing or accreditation facilities in different parts of the country and then only an integrated national blood transfusion process can be established that will take care of the entire process from collection of blood from volunteer donors to the supply of the blood products to the hospitals (Ranasinghe 2000). The ultimate goal of the Blood Council in Saudi Arabia must be to become a world-class blood service and to ensure that all in need of blood in Saudi Arabia get safe and high quality blood that is free from all infections, where ever and when ever the need may arise. Appropriate number of health workers have to be deployed to make this service a success to support the common goal of the Saudi health sector, the health providers, patients and donors. The goal of the Commission has to be the implementation of a blood management system to effectively manage the collection, accreditation testing, taking care of logistics, inventory and an efficient blood banking system for the entire country. National standards have to be set to improve the safety and quality of clinical processes, collection procedures, processing and laboratory procedures. A software must be developed that will enable the Blood Council in Saudi Arabia to improve communication with donors and effectively and efficiently manage

volumes of collections across several sites. A National Tissue Lab with international collaboration has to be formed to improve the availabletechnologyand to achieve synergy amongst the blood banks. It is also important to establish the implementation of international best practices in testing methods so as to effectively detect HIV and Hepatitis. It has to be an on going process to apply appropriate technology and international standards so as to improve standards and to ultimately attain self-sufficiency for the blood products.

The distribution of blood in hospitals is often dealt with under the purview of the department of biomedical sciences and it has a demanding job of moving temperature sensitive blood to different locations and consequently there is an increased need of specialized logistics requirements for transporting blood and other biological substances at specifically controlled temperatures for research and use by patients in hospitals. Hence there is a challenge for managing such logistics in the face of delicacy of the matter since handling logistics and supply chain management of blood and blood products is highly regulated and a complex matter due to demanding needs of clients. Invariably there are situations when there are complications that require meeting stringent and constantly changing rules and regulations, transporting temperature sensitive bio substances and coping with the hazardous and perishable nature of such products. Internationally, there is the increasing risk of bioterrorismthat requires tighter security measures and stricter controls. Hence all who deal with such logistics have to be very reliable, must have a strong track record and be very trustworthy. Such players have to meet challenges of providing appropriate infrastructure and

at the same time make use of the latest products and technologies so that knowledge intensive solutions are provided to clients. Strict regulations are the main requirements in the face of challenges imposed due to lack of awareness and knowledge of using appropriate packaging and of how to handle the shipments correctly. This can be handled effectively only with proper training and familiarizing the staff with new and evolving rules and regulations in the logistics of blood supply management. Reports of the biomedicalsciencesector has shown a recent decline internationally, registering a decline of 34% in 2007, which has been attributed to low production of active pharmaceuticals ingredients due to shutdown of plants and change in government policies in several countries. But this industry had performed very well in 2006 when there was a 30% increase in productivity over 2005 (Brecher 2005).

Field logistics form an important part of the role of blood banks and hence it is important to examine how specimens are collected and what supplies are needed. Since there is always a need for donors of blood and in view of the fact that medical care, surgeries and medical treatment of several diseases cannot be possible

without the use of blood, a shortage of blood is least desired. Blood is usually collected from donors who are healthy and who meet strict criteria that relate to their medical history, physical health, possibility of having contracted transfusion and infectious diseases, sexual patterns, drug amenability and travel history to areas with instances of endemic diseases. The donor must producephotoidentification and should be in good health without being on any medication while donating blood. The donor is

expected to have hemoglobin levels that should meet established and predetermined Drug Control criteria and there should have been a minimum gap of 56 days after his last donation of blood (Wales 2001). All donors usually are required to fill up a questionnaire and safety form while undergoing the pre donationinterviewwith a health care worker, the purpose of which is to ascertain whether the particular donation is justified ethically and on health grounds. Utmost caution is taken to ensure that no infection of any kind is transferred to the door that may include AIDS and other infectious diseases.

The interview process during blood donation entails the filling out of a questionnaire by the donor in which questions are designed to identify potential health problems of the donor or infections for which he may be amenable or those that could be transmitted to another person in the donation process. A drop of blood is extracted from the donor by way of a small surgical stick for testing whether the blood has adequate hematocrit to justify the donation of the blood. The blood is drawn into a capillary tube, which is then made to go through a process to ascertain the levels of hematocrit (Heim 1991). The donor is made to relax in a comfortable and reclining chair, his blood pressure is checked and efforts made to maintain venous filling. The spot from where blood is to be extracted is identified and the selected vein at the chosen spot is disinfected, the needle used to take out the blood is inserted in the vein. The drawn blood is filled in the collection bag as a result of the gravity within a few minutes and the bag, which also contains a preservative, is sealed after a little blood is taken out in tubes for further testing. The needle is then removed from the vein and a

small bandage applied at the place of puncture of the vein, to be kept for a few hours. The donor is made to drink a nourishing drink and to eat some fruits to bring back some nourishment and is allowed to return after ten minutes.

One form of blood donation is autologous donation whereby the donor donates his blood for his own use. In such cases, since the blood is used for the donor himself, units with signs of infectious agents and with irregular blood group antibodies are acceptable, but in view of possible risks of human errors of wrong transfusion of an autologous unit in such inventories, units positive for hepatitis B and human immunodeficiency virus (HIV) should not allowed into the blood bank. If an autologous unit is collected but not used by the donor, then it has to be destroyed. The patient’s own blood can be used in other ways also such as prior to surgery, known as hemodilution, during surgery known as cell saver, and as wound drainage whereby blood is collected from cavities and returned through a filter after removing big items such as thrombi and tissue fragments.

Another form of blood donation is referred to as directed donation where “ directed” concerns a situation when the recipient of blood or blood products designates or brings with him certain people to donate specifically for his use. In general, blood collected from directed donations is as safe as the general blood supply because of the stringent screening and testing of volunteer donors that occurs in the normal course. A few problems with such a donation relate to confidentiality of donor not being maintained, the donor may not wish to answer all questions in the blood safety form and the health questionnaire. More over the procedure is not considered to be cost effective

and there may be contradictions related with transfusion related graft versus host diseases, alloimmunization of recipients, and there may be additional risks of hemolytic diseases of new born children in mothers receiving the blood from fathers. There is also a significant risk for TAGHVID in people receiving blood from relatives because of the similar genetics makeup. Since TAGHVID is considered to be mostly fatal, all units of blood collected due to such directed donation have to go through gama iradication to destroy white blood cells that could cause the disease. This greatly adds to the cost of blood processing and such units have to be destroyed if not used within 24 hours. Patients

who request such directed donations fromfamilyand friends do not realize the implications of the pressure that such requests can have on individuals who may not qualify to donate blood. In the event of such individuals being excluded from the blood donation due to their blood not being accepted, may become the subject matter of several questions about why his blood was not accepted. This procedure may encourage and prompt people to answer the questions incorrectly by giving wrong answers thus compromising on the safety of the blood and blood products.

The task of blood collection for transfusion is performed by blood banks as also by specialized collection agencies. In some countries all of the blood is collected by a single agency and in others there are multiple blood collection agencies. Many national Red Cross societies, in different countries collect blood donated voluntarily by donors, but in most countries the practice continues of blood donars being paid for their blood. In the developed countries blood for transfusion is obtained fro voluntary donors while the

blood that is used for extracting plasma and other blood products is fom professional donors.

In most countries the process is such that the whole blood is spun centrifugally so that it is seperated into different components. The most dense parts, that comprise of red blood cells, are treated with additive chemicals to extend its shelf life to about 45 days. which can also be stored in low temperatures. When buffered with glycerol, Red Blood Cells can be frozen, which are then given a time frame of validity of about ten years. The less dense part of the blood plasma is transformed into different compositions and are labeled accordingly in relation to their future use. The plasma is given labels as Fresh Frozen Plasma so that it can be used for transfusion purposes and if it is required to be used for making other products it is often marked as plasma for fractionation. These blood components should be stored in very low temperatures much below freezing point to make their use effective.

The layer that is found between the plasma and the red cells is often referred to as buffy coat and may be seperated to transform it into transfusion related platelets. Platelets that are more or less the same as whole blood can be stores for a short period and are then collected and synchronised so as to enable their effective use in transfusion. Such platelets have to be stored at normal temperature They are stored at room temperature in solutions that are nutritive in nature, but they are also prone to immense risk of bacteria growth due to their storage status at room temperature. Blood is also obtained by using the apheresis process, the most common component of such blood being platelets obtained with the

technique of plateletphereses. In this context red blood cells and plasma are extracted with similar techniques and there is no difference in the components of such a product as compared to that is extracted with manual techniques.

To create a technologically aware team of experts to handle the requirements of functions relating to supply chain management of blood and blood products, the Saudi Arabian government has to introduce a study course for creating specialists in Blood Banking, which will be designed to teach students the skills and expertise to become successful blood bank managers, educators, technical specialists and quality control professionals. After having successfully completed this course the students will have the opportunity to pursue a course leading to the Master of Science degree in Transfusion Medicine. The studies for this program will incorporate expertise in all fields of transfusion medicine, networking with researchers and educators of international repute, and will lead to experience in reputeddiagnosticreference laboratories. All aspects of blood collection, component preparation, donor testing, inventory management of blood, quality systems, compatibility testing, transfusion therapy, donor management, immunohematology, hemapheresis, molecular genetics, hemostatis, platelet and neutrophil immunology, administrative procedures and educational techniques will be learnt by students. There will ideally be two main parts of the curriculum comprising of clinical experience in different departments and lectures given by blood center experts and specially invited speakers. There will be a structured format that will permit students to complete the course in one or two years. A big advantage for

those pursuing the course will be the ability to interact with experts and seasoned professional who have spent a considerable part of their lives in this field. The faculty will be experts in their given area which will comprise and be inclusive of platelet and neutrophil serology, cellular immunology, transfusion medicine, histocompatibility and immnohematology and molecular genetics.

Managing an adequate blood supply is the key to preparedness during emergencies especially in view of the present day trends of increasing hospitalization and advancement in medical technology. Although, with improving techniques, the over all blood supply in Saudi Arabia has been increasing, and more and more people are becoming eligible and realizing the need to donate blood, it is imperative for blood suppliers to focus on emergency planning and to maintain adequate inventory. Local and temporary shortages of blood do occur at times and the supply side appears to be generally adequate, but it is necessary for the community to respond to the need to donate blood during times of need, and this can be improved only if the people and society start to take necessary steps by learning from past experiences, such as the emergency requirements of blood that arose as a consequence of the terrorist attacks of September 2001. If there can be effective coordination and collaboration amongst blood banks, that in Saudi Arabia comprise of the government hospitals, a few private sector clinics, Red Cross and other NGOs that run blood banks, there can never be a situation that will witness any kind of blood or blood products shortage in the country.

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