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Operation Blood Bank

Healthcare Management

Members

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Abstract

Despite the fact that the number of people in Thailand who require blood is increasing, the amount of blood available is restricted. As a result, effective blood management is important since it can help to reduce blood shortages and improve blood quality. We make the decision to redesign the blood transportation system in order to transfer blood more swiftly and efficiently for the transporters, as well as to provide high-quality blood.

In addition, we decide to unlock the problem by adding a cabinet-like device in the operating room to keep the blood bags. The device has the ability to regulate temperature and classify blood groups. This reduces the quality loss of the blood and makes it more convenient for hospital officials to use.

Finally, we recommend that hospital workers be informed about the procedure, and we are testing the device at one of the hospitals. If it improves the effectiveness of the blood bag transportation, we would disseminate this device nationwide.

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Chapter 1

Situation and Scope

1.1 Introduction

The demand for blood is caused by human's sickness which cannot be controlled. Nowadays, there are patients that have the needs in spare blood for procedure over 36,000 units per year (American Association of Blood Bank; 2013), and every 2 second platelets are being used (American Red Cross). In other words, Public health system in Thailand have a tendency of increasing in blood demand. Result in limited blood supply. Furthermore, blood that is a medical resource is restricted to utilize limitedly on 35-42 day (World Blood Donor Day; 2020). From these mentioned reasons, good blood management is considered to be very crucial. Because it can decrease blood shortage and blood expiration.

From this problem, we ponder about the importance of activities involving blood supply chain. Especially, blood allocation from the distributor to many hospitals.

Normally, when there are blood donators, the personnel in blood sparing sector have to bring blood that obtained from the donation to the supplement sector. Then it is dispensed to the lacking hospitals. For this reason, we have an idea to design blood management so that the transfer of blood supply received from donation is faster and more efficient. It can also reduce the problems of blood transportation that may deteriorate the quality of the blood. This will benefit the public health system of Thailand.

1.2 Scope

One of the important variables that reduce the efficiency of blood is temperature. Normally, the blood must be kept at a temperature between 2-6 degrees Celsius. So when donating blood, blood must be transported by specialized personnel. However, improper storage of blood can occur which will cause the blood to experience temperature change from high-temperature environment causing the blood to be degraded and gradually change from blood to plasma. By the work plan of this project, the we will design to bring the blood bank into the operation room. In order to reduce the chance of blood quality degrading, and also to make the medical personnel convenient in treating patients.

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Chapter 2

Stakeholders, Difficulties, and Problem areas

2.1 Stakeholders Identification

Stakeholders	Goals	Perceived Difficulties	Perceived Root Cause	Suggested Alternative Solutions	Additional Insights Provided
Patients	Access to efficient blood	Received blood that had been degraded by temperature during blood delivery.	Transportation utilizing which the temperature cannot be maintained.	Set up a small blood bank in the surgical department to prepare for surgery promptly.	Bringing good quality blood to the patient in one step will reduce the efficiency of the blood to a minimum.
Transporting Personnel	Reduce work procedures	Slow blood transport	Must be transported to the blood bank first, and then referred to the surgical department.	Organize a small blood bank in the surgical department to reduce the process of blood transport.	Minimize this process so that you can do other tasks on your part in a faster time.

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2.2 Difficulties

Blood is normally kept at a temperature of 2-6 degrees Celsius to maintain its oxyhemoglobin. If the temperature exceeds 6 degrees Celsius, the rate of bacterial contamination in the blood increases. If it is lower than 2 degrees Celsius, it will cause red blood cells to break down (Hemolysis). If we give the hemolysed blood to the patient, it may cause Renal Failure and Bleeding Disorders. Which as mentioned about the obstacle, patients are directly affected by the deterioration in blood quality. Therefore, the temperature outside the blood should not be changed frequently. The blood must be kept at a constant temperature all the time, and be convenient to transfer to the patient as soon as possible with the least temperature change. On the part of the blood carrier, the person doing this task needs to take the donated blood to the blood bank first, and then takes it to the surgery department. This causes the blood to have frequent temperature changes, result in the efficiency of the blood reduced. In conclusion, the process of blood travel must be reduced in order to maintain the quality of the blood.

2.3 Problem Areas

From the fore mentioned obstacles, problems can be divided into 2 groups: 1. Direct problems and 2. Indirect problems. The direct problem group is the obstacle patients encountered, because they are those who are directly affected by the loss of blood quality. It is the temperature that changes the properties of the blood and causing the workflow to be compromised. The indirect problem group is the obstacles faced by blood carriers. Blood donors must take the donated blood to one place and then go to another place to use in the procedure. The current transport causes the transportation of blood to the operating room more to be slower than it should be, and thereby reducing the efficiency of the blood being delivered to the operating room.

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Chapter 3

Issue Statement and Problem Statement

3.1 Stakeholders' Problems

Direct problem: What should be done to ensure that patients receive the most effective blood they should receive?

Indirect problem: How can the distributor be able to transport blood with the best efficiency of the blood?

3.2 Overall Problems

These days, blood donations are accepted for bringing the donated blood to donate to the patients, but people may not know that transporting blood can deteriorate the quality of blood. The people who are directly affected by this are those who have donated blood. If the blood quality is not as good as it should be, it can cause various health problems with patients. Each time the blood is transported, it has to go through several processes which reduce the quality of the blood unreasonably. Because it must pass through several places where the temperature is not stable, causing temperature changes all the time which deteriorate the quality of the blood. All of the above, the link between the problems of the two groups was a decrease in blood efficiency. The problem that needs to be solved is How to make blood transportation to not reduce the efficiency of the blood?

If this problem is solved, the standard of blood transported to the patient is expected to be higher, reducing the risk of patients developing various diseases from receiving blood that is of poor quality. And also the solution in this section will make the transportation of donated blood faster and be ready to use in various departments of the hospital. Therefore, there is no need for people to transport blood to hospitals as today. In addition to that, the people who carry blood in the hospital will not be hired consequently saving the hospital budget.

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Chapter 4

Root causes and Alternative solutions

4.1 Root Causes

The disunity of each unit make the efficiency of work, that must be related to each other, is not as good as expected. For instance, the departments doing procedure being in a different location from the blood bank, make the blood that is usually required for surgery must be reserved in advance or withdrawn from the blood bank first. As mentioned above, it is disturbed by temperature changes including limitations in terms of time when taken out of the blood storage. There will be steps that require a break before using the blood. If the duration is too long, it will make the blood ineffective and end up becomes threatening for the patients who receive it.

4.2 Possible Solutions

Usually, even in both private and government hospitals, patients' information is available. Most of it are digital, which can be viewed with a barcode. The registration requires a blood type test to be useful in checking when information is needed. This solution uses barcode to indicate the patients' blood group, where there are a cabinet or a machine that store it. Collecting in a blood bag with indicators that are sensitive to temperature attached directly to the blood bag during storage. They are divided into each blood group and Rh group stockpile in the operating room for convenience and transportation. This reduces the loss of blood quality when undergoing temperature changes. When you want to use it in procedure, bring the patient's information in barcode to read at the machine. Then the machine will identify the patient's blood group. Thus, the blood group that matches the patient can be used accordingly.

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Chapter 5

Decision

5.1 Criteria

Problem Area	Criterion		
Direct Stakeholders (Patients)	High quality blood access	Reduce the risk of receiving harm from compromised blood.	Become Healthy
Indirect Stakeholders (Distributor personnel)	Limited transportation time	Increase the quality of other tasks by having more time.	Lighten the burden of works.

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Direct Stakeholders

Getting good quality blood increases the procedure performance to the best coherence. When the blood is of poor quality, it results in poor surgery and risking the patients of harm from the blood. Everyone comes to the hospital because they want the best and safest treatment which is morally correct and meet the satisfaction of direct stakeholders.

Indirect Stakeholders

Reduction in transfer time if considered to have save time for personnel who perform duties in this section to have more time to do other duties of their own providing a reasonable period of time to work and improving the quality of work by getting more time from reduced transportation. Making it possible to work with the highest capability and create complacence for the group of personnel responsible for this part.

5.2 Extras

- Blood efficiency based on variables, and where to place the machine that will not lessen the potential of the blood and the relationship of blood received with the recipient's body in different temperatures.
- Blood works best at 2-6 degrees Celsius because it is a temperature that does not cause abnormalities in the blood, and should not place the device in a musty area to prevent bacteria, germs, and contaminants.

Chapter 6

Conclusions

6.1 Adjustment

The most efficient blood conditions are at a temperature of 2-6 degrees Celsius. Blood will be contaminated by bacteria, if the surrounding temperature is higher than the regulated range. Additionally, if the temperature is below 2 degrees Celsius, the blood is hemolysed and when the hemolysed blood is delivered to the patient, the patient will be at risk of Renal Failure and Bleeding Disorders. Therefore, the solution to this problem was analyzed in the part of the blood bank that is the reservoir of donated blood. It is desirable to be transported quickly and with as little change in temperature as possible in order to maintain the oxygen transport capacity and properties that keep normal blood.

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Direct Stakeholders (Patients)

1. Solving Method
    1. Receives high quality blood
    2. Reduce the chance of obtaining diseases
    3. Become healthy

Stakeholder A termination:

Advantage: Trusty validation

Disadvantage: Extra cash necessary

Strength: High quality blood receiving

Weakness: Unexpected accident led to the loss of credibility

Indirect Stakeholders (Distributor Personnel)

1. Solving Method

    1. Limited blood transferring time
    2. Optimizing other indispensable work
    3. Lighten the burden of works

Stakeholder B termination:

Advantage: Lighten the hospital's personnel tasks

Disadvantage: Specification employee being unemployed

Strength: Increase the quality of other tasks by having more time

Weakness: Unpredicted work time

6.2 Conclusions

Based on the information mentioned above, the solution to these problems is to move the blood bank into the operating room by creating a small size for ease of use and maintaining the condition of the blood to be able to work fully. As well as using barcode to identify the patient's blood group by obtaining information from the database that they have registered for convenience in specifying a blood bag containing each blood group. The reason for choosing this method is because it is a stable method and can keep the blood quality working at its best including less chance of error. Making operation with this system go smoothly, but there may be a problem in the beginning due to the need to adapt to the imported work system. This system works by keeping the temperature stable in the range of 2-6 degrees Celsius according to the data the researchers have studied and concluded. Thus being the best solution.

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