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BLOOD DONATION INNOVATION APPLICATION CONCEPT

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Abstract ¾ or 1page

Kenya has a population of 47.6 million and the World Health Organization advises that a county should be able to collect blood from 1% of the population. In line with this, Kenya should collect about 460,000 units of blood per year. The problem comes in when the hospitals in the counties have no access to blood as the donated blood never gets to them.

Blood transfusion is a free service as evidenced by PEPFAR funding the whole program until recently, when it cut its funding. This has put the medical industry in limbo and stakeholders in the county such as Kenya National Blood Transfusion Services (KNBTS).

Hospitals in Counties have not been able to access blood resources and this has affected patient health. This system aims to bridge this gap and also ensure transparency in blood donation and screening and distribution of blood. This project aims to find challenges hospitals face when requesting for blood units and the availability of the blood groups which would help in determine the frequency of requests.

The research methodology adopted for this project is questionnaire and the data collected pointed towards lack of transparency in blood collection and distribution. In conclusion, the system solely depends on the implementation of the methodology adopted as the stakeholders will play a key role. The system tackles an existing problem in the medical industry in Kenya and the problem is synonymous with medical industries in the third world as corrupt officials try to enrich themselves by selling the blood. This should never be the case.

1.0 Introduction

1.1 Background of the Study

Background information done in several countries such as; Australia - https://transfusion.com.au/itransfuse

The iTransfuse App promotes safe, appropriate and evidence-based transfusion by providing bedside access to transfusion, education tools and resources.

Hong Kong

HK Blood" mobile app is developed by the Hong Kong Red Cross Blood Transfusion Service to provide the latest news of blood donation and to make blood donation in Hong Kong easier than ever.

Ireland

The app will offer the IBTS the ability to contact specific blood types at times when the blood supply is at critical level. Users who do not wish to be contacted in an emergency may opt-out of this notification

1.2 Problem statement

Inaccessibility to proper blood transfusion procedures and centers especially in countries that are not well developed economically like Kenya. This is a major challenge in the continent which this system aims to bridge the gap. Lack of enough blood units is also a challenge as people are not willing to donate, contamination of blood units and the fact that most hospitals lack proper equipment to screen and store blood. Also, there are challenges in communication between centers especially when it comes to distribution of blood units from satellite centers especially now with the influx of black market blood.

1.3 Objectives of the study

1.3.1 Overall goal

To design and develop a customized Hospital Request System application that enables efficient access to stored and available blood for all parties involved through proper and easy communication channels.

1.3.2 Specific Research Objectives

1.3.2.1 Specific research objective 1

To find out the challenges faced by hospitals in requesting for blood units from satellite and national blood centers.

1.3.2.2 Specific research objective 2

To determine the availability of the required blood groups for transfusion.

1.3.2.3 Specific research objective 3

To determine the frequency of requests for blood to be used for transfusion from satellite and national centers.

1.4 Research Questions

What are the challenges that hospitals face when trying to access blood units from national and regional centers?

What are the benefits of a customized hospital blood request system?

What is the best way to link up hospitals to national and regional blood transfusion centers?

1.5 Scope of the study

The system will allow hospitals in Kenya to be able to access national and regional blood centers remotely and view their databases to check on the availability of specific blood types. The system will also allow login for the hospitals after which they can go ahead and request for specific units of blood from the centers.

This project will enable the country to achieve the 3rd UN SDG based on health.

1.6 Significance of the study

This paper is relevant to Sustainable Development Goal (SDG) 3, specifically, to ensure healthy lives and promote wellbeing for all at all ages.

This is achieved through opening up the channel that links blood transfusion centers country wide and enabling efficient access to centers and patients in need of blood. Blood transfusion saves lives especially in cases of emergency

Such a system will reduce the delay time usually experienced between the centers and enable faster screening, grouping and cross-matching of blood.

2.0 Literature Review

2.1 Introduction

2.0 Introduction

In the world, currently, there are so many systems that have been developed that aim to solve the problem of blood transfusion or even linking up donors and recipients to ease the process of blood transfusion. Such systems as with all other systems have their strengths and weaknesses and in this chapter we analyze them as well as well as expounding further on the specific research objectives for this system.

2.2 Literraure revew on based on the specific research objectives

2.2.1 The challenges faced hospitals in accessing adequate blood units

Many hospitals in Kenya under the current set-up are either not well equipped to gain access to blood units or do not have proper channels of accessing the blood units. This is a challenge especially in times of emergency. Hospitals in Kenya also have a hard time dealing with black

market blood which is pumped into the industry by greedy individuals. There is a shortage of blood in the country at the moment and this is due to several factors e.g. Black market blood, schools have closed and that storage facilities in most regional centers are in poor condition. The US government has also cut funding for blood donation in the country and this has greatly impaired the industry as even access to reagents and blood bags has become a problem.

2.2.2 The benefits of blood transfusion and donation system

To determine if a hospital blood request system is really needed within the current hospital set-up. The project also aims at establishing if a hospital blood request system is really needed and how best to introduce it to the hospital set-up. The project will also aim at finding out the resources and framework required to achieve such a feat

2.3 Conclusion

Existing blood transfusion systems are an important benchmark to help me develop this system as in order to outdo them and develop a system that is tailored to suit the needs of a Kenyan market, I have to incorporate most of their functionalities.

3.0 Research Design and Methodology

3.1 Locality of the project and Beneficiaries to the project

The system will be implemented in Kenya and specifically the hospitals in Nairobi will be used to carry out the pilot scheme. Nairobi is well placed geographically and is statistically where most blood transfusions occur. The beneficiaries of this project will be hospitals and patients in need of blood.

3.2 Research approach

3.2 Population of the study (Target group) and Sampling method

A sample refers to the target population for a survey which is the entire set of units for which the survey data are to be used to make inferences. It must represent the population it is drawn from and must have a good size to authorize statistical analysis. The target population is a group of individuals or objects to which researchers are interested in generalizing their conclusions (Cox, 2006).

The sample I will use will be 15 Nairobi county hospitals and centers that have a blood bank or are near one. The hospital size chosen will represent the characteristics of the whole population and will allow me to get feedback on how many hospitals would be interested in such a system and the kind of features they would expect to be included in the system.

3.3 Data collection methods and Primary Data collection methods

Data collection is the process of preparing and collecting data. The data is specifically collected to provide information on a particular subject. It can be classified as primary and secondary data collection methods. According to Blum and Foor (1986), there are eight different types of data collection methods. This includes observation, experiment field research, archives, case history, group discussion, survey, and simulation. Blum and Foor further explain that despite their differences, all these methods are equally good. Primary data collection methods include Interviews, experiments, surveys and observation and secondary data collection methods include library sources, internet sources, journals, reports etc.

3.3.1 Primary Data collection methods

These methods involve data that is collected for the first time. For the proposed system, interviews and observation methods were done.

3.3.1.1 Questionnaire

Some of the hospitals in Nairobi were interviewed with a view of determining the necessity of establishing a Hospital blood request system and their feedback was noted. I also interviewed some patients to get their view on how accessible blood units are and how fast they get the units delivered on average. Interviews were done randomly in order to get different views from different sources.

3.3.1.2 Observations

Various hospitals in Nairobi were visited and the areas that needed attention were written on paper. This helped to determine the specific processes that are not efficiently carried out thus complicating the whole process of blood transfusion. I also made phone calls to some hospitals in Kenya to determine the challenges they face when requesting for blood and how they access blood, if they are able to.

3.4 Data analysis methods

Data collected from the various sources will be analyzed with simple, descriptive, statistical and analytical tools such as frequencies, percentages, graphs and charts (control, pareto, monitoring, bar, pie etc.).

4.0 Research findings and analysis

4.1 Response rate

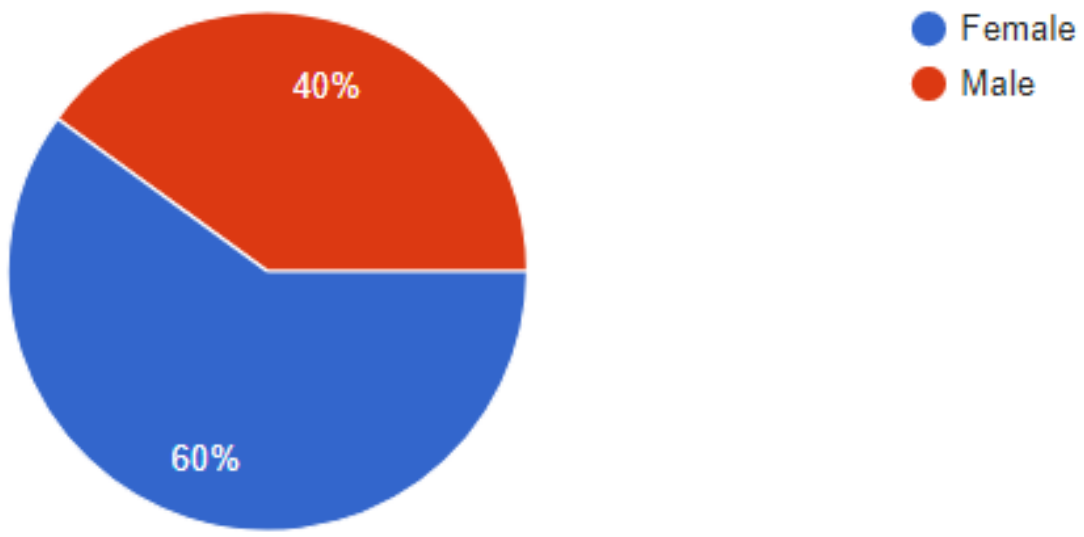
Response rate refers to the number of people who answered the questionnaire divided by the number of study sample. (Holtom,2008). In my case, I administered 15 questionnaires and of which 15 people completed the study successfully. This turn up rate gives a response rate of 100%.

4.2 Demographics results

5.2.1 GENDER

Out of the 15 responses in terms of gender, 60% represented female while 40% represented male. The bar graph below shows the gender distribution.

Figure 5.2.a Bar graph response on gender

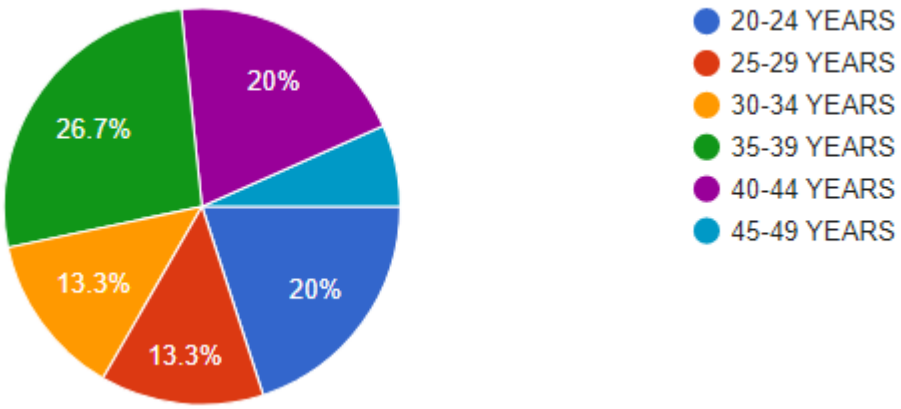


SOURCE: AUTHOR DATA 2019

5.2.2 Age

Age Bracket: the bar graph below shows the age distribution during the study

Figure 5.2.b

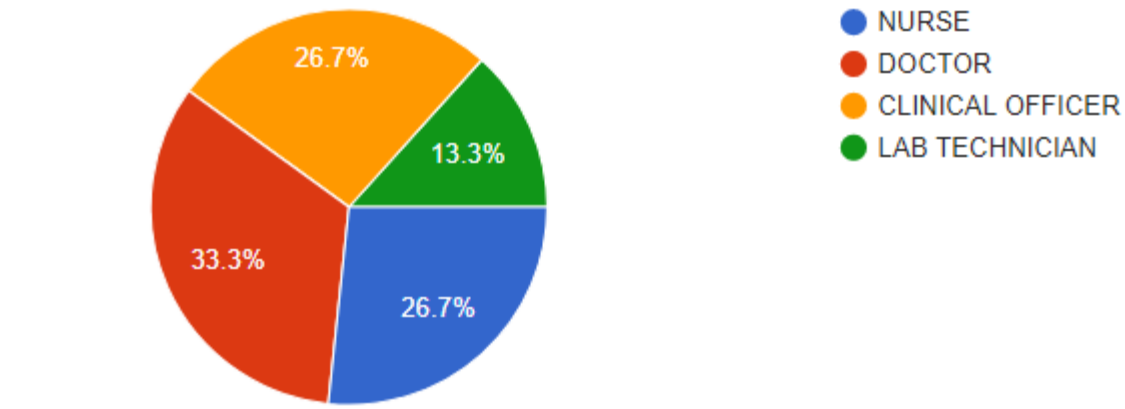


SOURCE: AUTHOR DATA 2019

5.2.3 Occupation

The study covered the occupation of the respondents. The bar graph below indicates the distribution of the occupations of respondents.

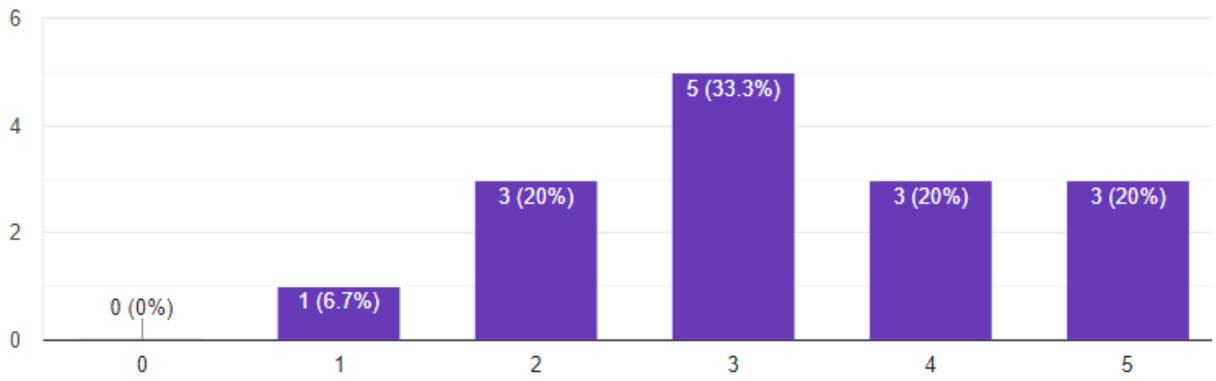
Figure 5.2.c



SOURCE: AUTHOR DATA 2019.

5.2.5 Frequency of Blood Donation. The study further sought to find out the frequency of blood donation per hospital. The data is represented in the pie chart below.

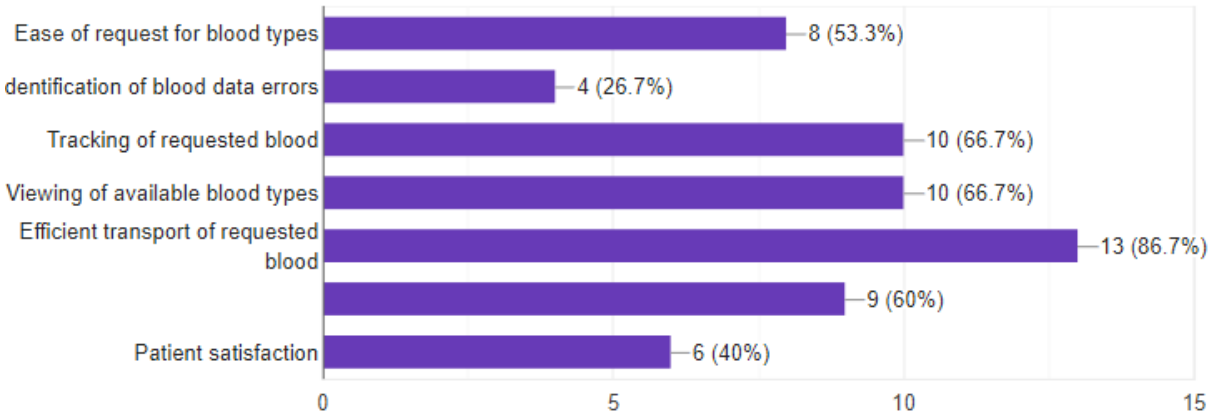
Figure 5.2.e



SOURCE: AUTHOR DATA 2019

5.2.6 Expected benefits of the System. The study further sought to find out the expected benefits resulting from the implementation of the system into the medical industry. The data is represented in the pie chart below.

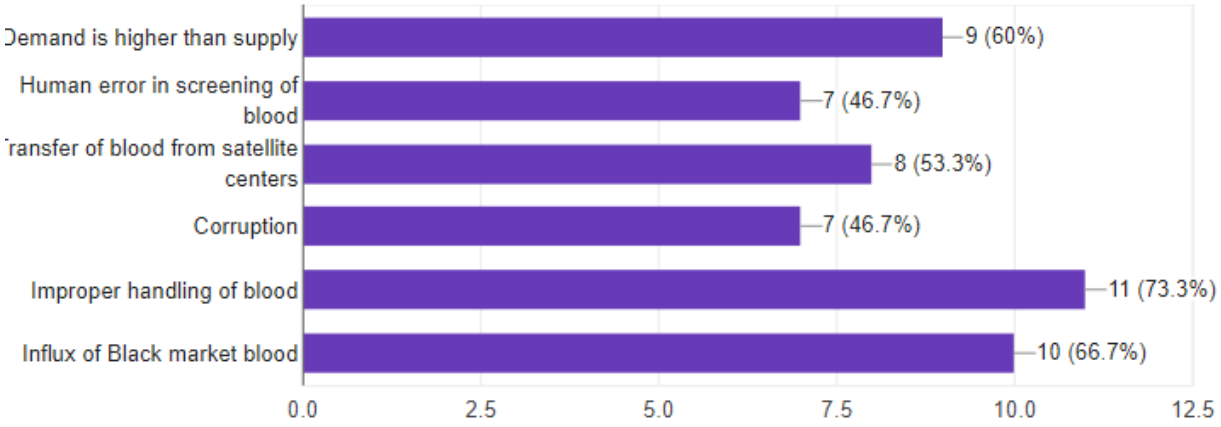
Figure 5.2.f



SOURCE: AUTHOR DATA 2019

4.3 Results of Specific Research Objective 1: To find out the challenges faced by hospitals in requesting for blood units from satellite and national blood centers.

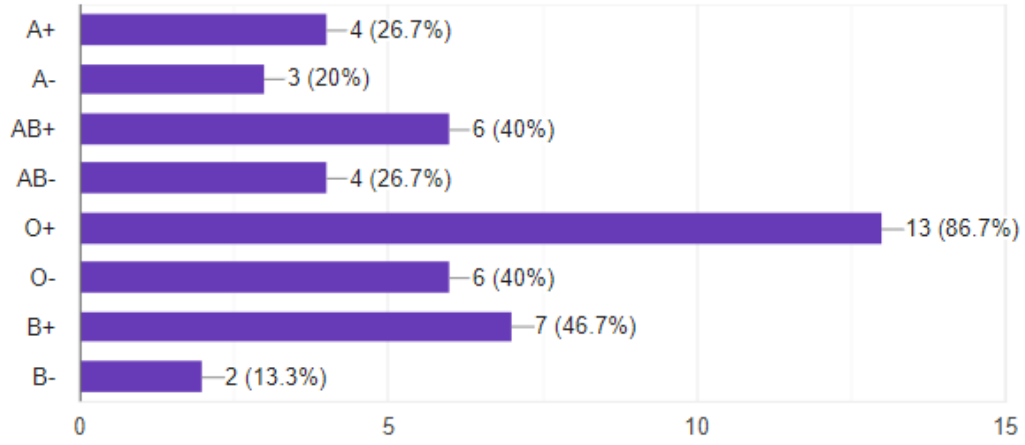
The study found out that most blood is usually not handled well as well as influx of black market blood. The challenges below were generally experienced by most hospitals.



SOURCE: AUTHOR DATA 2019

4.4 Results of Specific Research Objective 2: **To determine the availability of the required blood groups for transfusion.**

Blood group availability is key as it enables hospitals to make the requests depending on the compatibility with the patients in need. The graph below shows blood group availability.



SOURCE: AUTHOR DATA 2019

5.0 Discussion conculsion and recommendations

5.1 Discussion

From the study above 60% of the response was from Women and 40% from Males. The most dominant occupation from the study was for Doctors indicating a bias of Doctors favoring to answer the questionnaire at 33.3% with Lab technicians being least favorable at 13.3%. From the response it was evident that the hospitals do encounter numerous problems when requesting for blood which was the first objective of the study. The most predominant ones were improper handling of blood, influx of black market blood and demand being higher than the supply at 73.3%,66.7% and 60 % respectively. Some of the other challenges of note were Transfer of blood from satellite centers and corruption in the industry at 53.3% and 46.7%. These results indicate that blood is usually not handled properly leading to contamination and this could be due to it not being tracked and poor communication between satellite centers and hospitals which might result in blood going to waste. There is also the issue of black market blood which is usually obtained through undue means and can be overwhelming to patients and honest medical staff alike especially if it is sourced by desperate relatives who collude with rogue staff. This can put the patient's life at risk. The system makes obtaining blood easy and efficient for all involved parties.

Hospitals need blood to conduct transfusions and they usually request for the blood from the satellite centers and national centers. The number of requests for blood was on average almost a 5 indicating the need for blood from hospitals and how it is done currently is by phone call, which is inefficient and most times prone to error. The other important factor of note was which blood groups are usually readily available and this was evident as it was O+ at 86.7%, B+ at 46.7% and AB+ at 40%. It is important to note that O is a universal donor and AB is universal receiver thus explaining their availability. 86.7% of the respondents expect this system to enhance the transport of blood and this is an important indicative factor as to the viability of the system with the current industry needs. 66.7% of the respondents also want a system that tracks the blood and also being able to view the available blood groups so as to easily request for the blood (Blood Types). Hospitals need to make the process of requesting and acquiring of blood easy and efficient as it puts the health and life of most patients at risk and this is something that is avoidable.

5.2 Conclusion

The system will definitely suit the medical industry especially with the current situation of using phone calls to make the requests. It is efficient and easy to use and can be easily used by medical staff to request for the blood units.

5.3 Recommedations

The system can be deployed countrywide especially with the introduction of cheaper data bundle rates and the Government is working hard to make internet easily accessible to all Kenyans and this will make it easy for the system to be implemented in grass root regions. The government is also working on passing a bill in parliament that will make all blood donation, distribution and transfusion services centralized under one body. This makes this system vital for that structures functionality

5.4 Future work

The system aims to adopt blood platelets and serum functionality as these transfusions are also important only that few hospitals can offer such. Hence, with the advancement of the medical/health sector, the system will easily adopt these parameters.

6.0 References

(n.d.). Retrieved from Irish Blood Transfusion Services: - https://www.giveblood.ie/media/newsroom/press_releases/2014/app-launch-2014.html

Blood Types. (n.d.). Retrieved from NHS Blood and Transplant: https://www.blood.co.uk/why-give-blood/blood-types/

Esplin, C. (2016, October 24). *What is Firebase? .* Retrieved from How To Firebase: https://howtofirebase.com/what-is-firebase-fcb8614ba442

Functional and Non Functional Requirements; Specifications and Types. (2018, May 29). Retrieved from Altexsoft: https://www.altexsoft.com/blog/business/functional-and-non-functional-requirements-specification-and-types/

iTransfuse App. (n.d.). Retrieved November 2019, from Auistraliann Red Cross Lifeblood: https://transfusion.com.au/itransfuse

Learn Java Programming. (n.d.). Retrieved from https://www.programiz.com/java-programming

Mobile& Apps. (2017, July 17). Retrieved from BizCommunity:
https://www.bizcommunity.com/Article/196/793/164740.html

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