Development of a Data Acquistion System for Blood Bank

S.K Subramaniam[1*], M. Esro[2*], N. Azman[3]

[1,2,3]Advance Sensors & Embedded Controls System (ASECS), Centre for Telecommunication Research & Innovation (CeTRI), Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia

[*]Corresponding e-mail: siva@utem.edu.my, mazran@utem.edu.my

Keywords: Blood bank; Data visualization; RFID tags

ABSTRACT – Investigation of the existing blood collection and tracking system is essential to efficiently manage, control & monitor on all aspect of a Blood Bank. A research has been made that most blood banks practicing stand-alone which may contribute to wastage of donated blood. For that matter, this collected data system allows connectivity between the blood banks to effectively conduct and systematically manage their daily activities within one integrated system. This application helps blood donation center receives the registered donated blood from any hospitals easily as it records the donated blood information in cloud immediately.

1. INTRODUCTION

Blood is considered very important because it is needed to deliver the nutrients and oxygen to the whole part of the body. There are four main types of blood which known as in categorization of ABO group which are A, B, AB, and O. There is one engrossing thing about blood. Our own blood is not merely giving benefits to our own selves but also able to save other people's life who has a problem with their own state of blood in their body, for instance, those who have anaemia, leukemia, sickle cell disease, haemophilia and etc. This shows how blood donation is essential in this life as this good deed able to help people who are suffering from diseases out from their misery. As stated by Health Minister Dr. S. Subramaniam, in Malaysia, there is about 2,000 bags of blood are needed each day by 925 patients who need transfusion due to diseases. He also said that this amount is not included in the emergency cases and those with rare blood types [1]. Furthermore, red blood cell is very important to be available for every minute as the road accidents, major surgery, and diseases which resulted in the loss of the massive amount of blood cases occur every day. This will bring to the thoughts that donation of blood is a very critical action to be taken in this world.

Some blood banks using a manual system to keep all the blood collection data and some of the blood banks have updated to a web-based system to store the blood collection data. Based on a manual system, the hospital staffs will record each of bloodstock details on paper and keep it in the file. The web-based system able to greatly secure the bloodstock details as they will be saved in the cloud storage. The usual record of blood collection data based on the manual book [4] are; (1) Date blood was collected, (2) Expiry date of the component prepared, (3) Blood group of the blood component, (4) Donation or pack number, (5) Name and volume of the anticoagulant solution, (6) Name of the blood bank producing the component, (7) Temperature of storage. The management of the lifespan of blood is a very crucial part to take note because it is related to the quality of blood for transfusion. The blood will be kept in the freezer or refrigerator with the specific temperature in order to remain the quality of blood. B. Armstrong et al. stated that for ease of access, the blood or any other laboratory reagents are stored in the blood storage in an orderly way to make sure the blood with early expiry date will be used first [2]. This principle or as known as first-in-first-out policy (FIFO) should be followed as the usage of blood which closer to expiry date may avoid from blood wastage as stated in the book [3-4]. Blood bank will always maximize their effort to not let any blood to be thrown away. If there is any bigger hospital which is busier and need blood more it will be shipped over there to avoid blood wastage. Although, this matter is still unavoidable and if the blood gets expired, it will be thrown away in biohazardous trash properly.

II. METHODOLOGY

This proposed work is primarily focused on web-based application where it can also be accessed through mobile phone by using mobile browser. In order to track the blood product details in the system, the RFID tag will be scanned on the RFID reader which connected together with the Arduino Leonardo board. Caspio is a cloud-based system which is used to create data page on the website application. Caspio is a visual application builder which is very suitable to utilize for the proposed work to visualize the donated blood details. Caspio has limitations which the users need to purchase it at specific price for full version. As for trial version, only three data pages can be built. Caspio able to build website application with only requirement of little coding. Yola is used in this proposed work as a website builder.

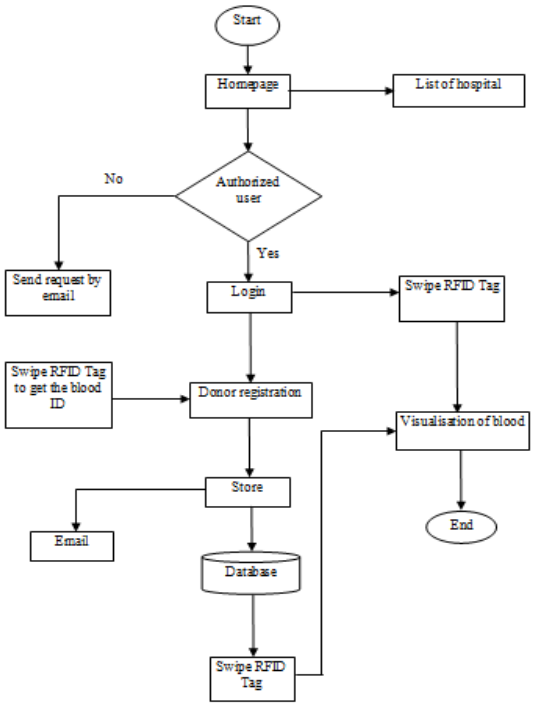

Figure 1.1: Flowchart of the system

III. RESULTS AND DISCUSSION

This proposed research come as a system that able to integrate the whole blood collection data between blood banks existed in a country. It provides the visualization of whole blood packet details available in this country. It is produced as an application based which is a web-based. This system can only be accessed by the authorized users such as admin, doctors and other related staffs in the hospital or any health organizations. Those who desire to access this proposed work have to ask permission first by contacting admin through the websites to check whether they have qualification to be a part of the authorized users on the website. Staffs able to check daily activities of the donated blood such as the date of the donated blood collected, the expiry date of the blood, the manufacturer, blood group and etc.

Figure 1.2: Homepage of the Website

Patient_ID	Date_Blood_Collected	Blood_Type	Expiry_Date	Fridge_Name	Shelf_Column
1	03/07/2018	A-	04/17/2018	A-	3
2	03/07/2018	B+	04/17/2018	B+	2
3	03/07/2018	O+	04/17/2018	O+	2
4	03/07/2018	A-	04/17/2018	A-	3
5	03/07/2018	O-	04/17/2018	O-	1
6	03/07/2018	AB+	04/17/2018	AB+	1
7	03/08/2018	O-	04/18/2018	O-	2
8	03/08/2018	A+	04/18/2018	A+	3
9	03/08/2018	O+	04/18/2018	O+	2

Figure 1.3: Database of Donated Blood

IV. CONCLUSIONS

This proposed work replaced the practice of paper chart recorder into a cloud-based system by monitoring the donated blood details through an online website with mobile phone or computer which helped to minimize the difficulty for the hospital staffs in searching the blood packet details during an emergency. Besides, it allows all of the existing blood banks work together in one integrated system. Furthermore, it provides the facility for the hospital staffs to take quick decision which blood product need to be used first based on FIFO policy.

V. ACKNOWLEDGEMENT

This proposed work could not have been possible to complete without the assistance from many people whose their names may not all be mentioned in this paper. Our appreciation to the Pathology Department of Hospital Melaka for their valuable inside on the research as well to guide us through the standard operating procedure in the blood bank.

VI. REFERENCES

[1] J. Edward, "National Blood Bank: Enough, but we always need more | Malaysia | Malay Mail Online," 2015. [Online]. Available: http://www.themalaymailonline.com/malaysia/article/national-blood-bank-enough-but-we-always-need-more#ozaK7RMFrMMh7dSa.97. [Accessed: 08-Oct-2017].

[2] B. Armstrong, N. Abu Amin, R. Bhasin, N. Madan, and A. del Pozo, "Manual on the management, maintenance and use of blood cold chain equipment," United States Am. Dr. Graham Harrison.

[3] NACO New Delhi, "Standards for Blood Banks & Blood TraCo-investigator, Newnsfusion Services," J. Chem. Inf. Model., vol. 53, pp. 1689–1699, 2013.

[4] E. E. Guðbjörnsdóttir, "*Blood Bank Inventory Management Analysis*," 2015.