

Computerized Central Blood Bank Management System (CCBBMS)

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Abstract— Blood is a vital constituent in human body that is indispensable for human life, it supplies nutrient and oxygen to all body cells, because of this essential role, blood bank was introduced in this paper. Manual systems as compared to computerized systems are time consuming, costly, and human errors. A computerized central blood bank management system was developed to assist in managing donor records, monitoring blood screening and storing, moreover provide secure medical reports to improve medical service delivery. The system was designed and implemented as a web-based using My SQL data base, PHP programming language and a bar-code technique. The outcome was obtained as screens that made the recording process of donor's data and blood easier so as to ensure the efficiency of transfusion process. The system was tested in the National Blood Transfusion Center NBTC of Khartoum-Sudan, it contributed to solve errors of manual system, time consuming and retrieve data, as well as met users' acceptance.

Keywords Donor, blood bank, transfusion, Database, barcode, programming language.

I. INTRODUCTION

The requirement for the blood is an important factor in contemporary medicine and healthcare. For every second there will be an individual who needs blood to save life.[1] Blood transfusion is a life-saving intervention that has an essential role in the total patient management within health care systems.[1] The primary responsibility of a Blood Transfusion Service (BTS) is to provide a safe, sufficient and timely supply of blood and blood products. In fulfilling this responsibility, the BTS should ensure that the act of blood donation is safe and causes no harm to the donor. It should build and maintain a pool of safe, voluntary non-remunerated blood donors and take all necessary steps to ensure that the products derived from donated blood are efficacious for the recipient, with a minimal risk of any infection that could be transmitted through transfusion. [2] The screening of all donated blood for transfusion-transmissible infectious TTI agents prior to release for clinical use is a fundamental activity for any blood transfusion service. The development of a reliable and effective blood screening component of the blood transfusion service is therefore a key strategy for the provision of safe blood supply.[1] Management of blood and blood transfusion services in Khartoum is carried out by the National Blood Transfusion Center NBTC at the Khartoum, which processes blood and then distributes it to hospitals located all over the Khartoum. A situation is frequently encountered where some hospitals have more demand than they can satisfy which means there are no synchronized records of blood availability at any given point in time.[3]

Nowadays blood bank storage is file based. All data and information regarding blood, donors and recipients are kept in papers and files arranged in alphabetical or numeric order. This makes retrieval of data is hard and time consuming. Donors test results are recorded on papers too. This makes the data susceptible to errors and human mistakes which in turn put human lives in danger. Another problem with this system is the poor efficiency. Data Safety, security and backup is also poor as the papers and files can be easily stolen, lost or destroyed. This makes it an unreliable system.[4]

This study focus on designing a new system to maintain donation process by providing computerized system that saves donor information and blood tests details, using a programming language PHP which is a server-side scripting language, and My SQL database which is a program that can store large amounts of information in an organized format that's easily accessible through scripting languages like PHP.[7]

II. LITRITURE REVIEW

Many studies were conducted in the concept of blood bank, some of them concerned about managing donor records to facilitate the process of donation, the other focused on connecting blood banks to each other in one system and one database, the rest used modern technology such as electronic card and barcode system. Blood Bank Information Management System is an information system which helps to manage the records of donors and patient at a blood bank. It is mainly designed to store, process, retrieve and analyze information concerned with the administrative and inventory management within a blood bank [5]. Such kind of system will allow the authorized blood bank officer to login using a secret password and easily manage the records of the blood donors and the patients in need of blood. In addition, the blood bank information management system is not obsolete to the professionals; rather it plays a great role in attracting the donors and other stakeholders due to its simplicity in the reservation, and notification of donation time to the needy. On top of this any stakeholder and/or regional blood banks in need of blood can easily access to the type and quantity of blood available in any blood bank center[5]. The report by Dr. Sharad Maheshwari in the International Journal of Engineering Researcher and Application (IJERA), stated that in India, the blood bank management information system MIS is an integrated blood automation system. The web based mechanism interconnects all the blood banks of each state into a single network, The of blood bank refers all acquisition, validation, storage and

circulation of various live data and information electrically regarding blood donation and transfusion service.[6]

The Zambia Blood Transfusion Service (ZNBTS) with help from the International Institution for Communication and Development (IICD) has developed a computerized system that has digitalized registration of donor and send SMS message to blood donor reminding them that they can donate blood Again (2009).In addition to that the software make easier to reach blood donors by register their information and save it online in data base to be accessible from every office of the ZNBTS [5]

III. PROBLEM STATEMENT

The current situation in Sudan at the National Blood Transfusion Center NBTC -Khartoum is a paper based system which is suffers from lack of central data references, which result in time consuming for retrieving data in addition to lack of data security and human error which need of alarming system to avoid .

One of the most serious problems in hospitals is the lack of blood during emergency. The imperative need to transfer blood requires a proper management to determine which blood group is available. The second problem that led to design this system which in turn led to human errors is that the information about donor, blood grouping, tracing the data is complicated and time consuming when it is maintained manually. Moreover the manual system requires a lot of manpower, data is not secure, in addition to that Retrieval data and report producing are time consuming.

IV. OBJECTIVE

According to the problems mentioned above, the objective of the study had been obtained to design a system for a central blood bank management which provides real time information about blood component, grouping, donor information from collection to testing and use of blood product.

V. METHODOLOGY

The research methodology was built up with study, problem definition, data gathering, design, and finally conclusion. Based on to the objective, the National Blood Transfusion Center NBTC of Khartoum-Sudan had been visited, an interview had been conducted with the staff members of blood bank and the procedure of the blood donation had been described as step by step. The main activities of the blood bank are donor registration, donor information and testing, donation of blood, blood screening, blood stock management and stock movements, and currently there is a manual system to maintain the records of donor registration and blood screening which has a lot of problems and errors. Also it had been tried to acquire some of the forms they use in collecting information of donors. The collection data had been evaluated and analyzed and then the needed information was extracted. Management Information System which solved the problem mentioned above had been designed using PHP language and Microsoft My SQL database that was run on windows based operating system, the proposed system has eight screens that represent the main departments of blood bank, here data base was created and divided into tables based on the proposed screens

of the new system, each table contains the information about one screen of the system, then PHP codes was used to connect the data base with system' screens. The bar-code techniques was used and the system was able to create a bar code that save the essential donor information that will be read in each donation step, Here the mobile application QR Code reader was used to read the text number of bags as an alternative techniques of bar-cod reader.

VI. DESIGN AND IMPLEMENTATION

As it was stated in methodology, the proposed system was divided into eight screens, which represent the main departments in blood bank. The system is used to maintain the whole information about donor, blood and transfusion process in the laboratory departments, the system use a central database to store all inputs details including donor information, blood stock, and blood group's information. The proposed system screens are:

Admin, Data entry, Doctor, Fitness, Component, Virology, Quarantine and Serology. Each screen has its own table in the data base that contains all inputs of screen, also each one of them has its own PHP code that connects it with the database.

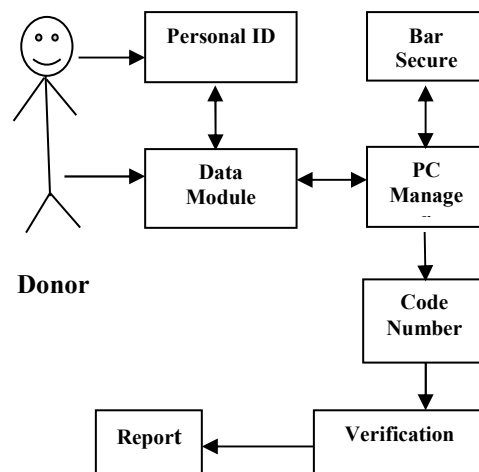


Fig. 1. The proposed system's block diagram

VII. RESULTS

Based on the information analysis, modules divisions, database creation tables, PHP code the system results in the following screens' layout.

Fig. 2. Login screen

Fig. 6. Fitness screen

REPORT

ID	User name	Password	Type	
13	data entery	1234	Data Entery	Change Password
11	Fitness	123	Fitness	Change Password
10	virus	123	Virology	Change Password
9	product	123	Product	Change Password
12	doctor	123	Doctor	Change Password
14	admin	123	Admin	Change Password
17	serology	123	Serology	Change Password
18	kr	123	Serology	Change Password

Fig. 3. Admin screen

Fig. 7. The creation of the barcode

Fig. 4. Data entry screen

Fig. 5. Doctor Screen

Blood Group	A+	A-	B+	B-	AB+	AB-	O+	O-
Quantity	4	1	3	1	1	0	1	1

Blood component	FFP	PLT	PC	Cryo.p
A+	1	2	0	1
A-	1	1	1	1
B+	3	3	2	3
B-	0	0	0	0
AB+	1	1	0	1
AB-	0	0	0	0
O+	1	1	1	1
O-	1	1	0	1

Fig. 8. Component screen

Fig. 9. Virology screen

Blood Group	A+	A-	B+	B-	AB+	AB-	O+	O-
Quantity	4	1	3	1	1	0	1	1

Blood Group	A+	A-	B+	B-	AB+	AB-	O+	O-
Quantity	3	0	2	0	1	0	1	1

Blood Group	A+	A-	B+	B-	AB+	AB-	O+	O-
Quantity	0	0	0	0	0	0	0	0

Blood component	EFP	PLT	PC	Cryo.p
A+	2	3	1	2
A-	1	1	1	1
B+	3	3	2	3
B-	0	0	0	0
AB+	1	1	0	1

Fig. 10. Quarantine screen

Fig. 11. Serology screen

The results of all previous screens shown in fig 2 to fig 11 enable to address the achievement of the working proposed system for CCBBMS as following points:

1. The system is able to save donor records for future references.
2. The system saves information about blood test results and gives permission to donate.
3. The system shows the stock in screen and updates it.

4. The system retrieves the information about a particular donor or blood components by reading a bar-code in the blood bag.
5. The system shows the expiration date of components and gives alarm when it gets expired.
6. The system saves time of work.
7. The system helps in minimizing human errors.

VIII. DISCUSSION

A successful transition from paper based to electronic health record requires careful coordination, from selection and implementation to training and maintenance. A prototype computerized central blood bank management system had been obtained after sequence of steps which result in several specifications, that shown as screens. The privacy screen is the main specification of the system that enable user to save their entered information. Flexibility of system to add more users is an important facility and benefit when using Computerized Central Blood Bank Management System CCBBMS, this allow to share different sub units. The computerized system creates an integration of information when all donor data, compatibilities of blood, virology blood tests and medical reports are saved in one database. All the world is directing toward new technologies such as bar-code technique, this computerized system use the bar-code technique to ensure and guarantee of every information entered to the system to avoid errors. From the point of view, the computerized system has a positive share in time wise by minimize time of work, and economic wise by minimize the number of staff and manpower,

IX. CONCLUSION

Computerized central blood bank management system CCBBMS is a system that used to manage and control all activities in blood bank departments. The systems save all donor records, blood information, testing results, distribution of blood to hospitals, discarding of bad blood and create medical reports. The implementation of the computerized management system was done in many steps: firstly the data about donor and blood has been collected by visiting the national blood transfusion center in Khartoum, then the gathered data was analyzing and the needed information was extracted. The system was designed by creating a database using My SQL and connects with PHP programming language code which results in system screens layout. The barcode technique was used in the system and the system was able to create a barcode that save the essential information. Another technique QR code reader was used to read the barcode. The system results in meeting the user requirements, it was evaluated by the members of blood bank staff and gives a reasonable acceptance. In general, this project designs only a prototype of central blood bank management system focus on the main departments of blood bank. CCBBMS has flexibility to modify to meet all needs and extend to cover other departments that not cover here.

X. RECOMMENDATIONS

After designing our prototype computerized central blood bank management system and the implementation of the essential procedures of blood donation, we recommend to expand the system to involve other departments in the central blood bank. It is also recommended to connect various hospitals with the central blood bank in one central database. It is recommended to train all staff of the blood bank how to use the computerized system and other technologies. It is recommended to conduct many projects and researches in blood bank in several scopes.

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