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E-Pharmacy Warehousing Management System

Ridhab Sami Abd-Ali, Prof. Dr. Salih Mahdi Al-Qaraawi, and Dr. MuayadSadikCroock

***Abstract*—Electronic Management System (EMS) has become widespread in all directions due to the efficient performance that can satisfy the user requirement. In this paper, an e-pharmacy based warehousing management system has been proposed. This system manages the medicine consumption cycle between the pharmacies at hospitals and the related warehouses (i.e. local and global). The proposed method is based on the technique of EMS to ensure the reaching of the medicine required. It is important to note that the system monitors the quantity of the involved medicines and manages the automated ordering procedure. This is done by receiving the orders from local pharmacies in the related warehouse for responding after checking the availability. The proposed system consists of two main parts, which are website and database. The website is designed using PHP, HTML and CSS environments, while the database is built utilizing MySQL version 5.7.11. The results show that the proposed system has achieved high performance and accuracy in terms of managing the warehousing and pharmacy operation.**

***Index Terms*— Electronic Management System, database, website design, PHP, MySQL.**

I. INTRODUCTION

Hospital Information System (HIS) refers to a computerized system designed to manage the parts of a specific hospital or group of them in terms of medical and administrative processes for achieving effective and efficient health services [1]. The resulting data from the HIS stored in hospitals improves the performance and quality of health care system following the steps of accessing, organizing, and using these data.

The electronic systems have been considered previously in different research projects due to its important and needs. In [2], the authors used the analytical methods to evaluate the required medicines by the pharmacy to be transferred to drug warehouses. This was done by organizing the given products into categories and calculating the quantities of each type of pharmaceutical products (shampoos, cosmetics etc), in which it eased the ordering of the drugs needed from warehouses. In [3], the authors reported a development of a clinical data warehouse that managed three affiliated public hospitals. They provided a description of the clinical data warehouse exploiting to monitor antimicrobial resistance and to measure antimicrobial use. In addition, the amount of time and money saved and the increased precision achieved have been estimated through the practical application of the data warehouse. In [4], the authors utilized the technique of incremental updates with triggers and intermediate table to tackle the date updates issue of medication data warehouse. This method was utilized as a part of the incremental updates of medication information. The proposed system managed different action upon the information such as insert, delete and update.

As mention above, this paper proposed an e-pharmacy warehousing management system based on built database and designed website pages. The proposed system offers an automated operation of issuing the prescribed medicines and ordering procedures. It deals with the quantity of involved medicines as well as the name and expired dates. The orders of the lacked medicines are sent automatically to the related warehouse for providing the local pharmacy with these items. The MySQL and PHP are mainly used for designing the database and website pages of the proposed system in addition to other supported software.

II. THE PROPOSED SYSTEM STRUCTURE

Figure (1) shows the block diagram of the proposed system structure. It shows the main parts and the required connections. It can be seen that each part of the system includes its own database and warehouse. All these local databases and webpages are connected to the main warehousing data center. This is to provide an efficient way of managing the whole system.

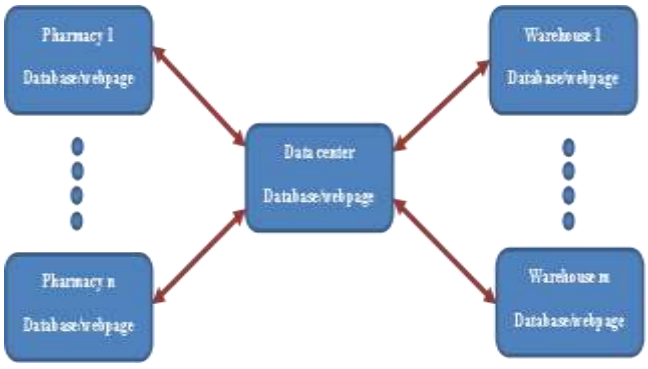

Fig. (1): The proposed system structure

III. . THE PROPOSED ALGORITHM

The proposed algorithm consists of two parts, one for pharmacy and other for warehouse of drugs. The pharmacy part composes of six main processes explained in the Figure (2) as a flowchart. These processes are:issuing drugs,adding medicine, deleting medicine, searching and editing, ordering,

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***Ridhab Sami Abd-Ali**, Computer Engineering Department, University of Technology, Baghdad, Iraq.*
***Prof. Dr. Salih Mahdi Al-Qaraawi**, Computer Engineering Department, University of Technology, Baghdad,Iraq.*
***Dr. MuayadSadikCroock**, Computer Engineering Department, University of Technology, Baghdad.*

and receiving order as:

☐Issuing drugs: This process is used to show the amount of issued drugs for the hospital through week, month and year.

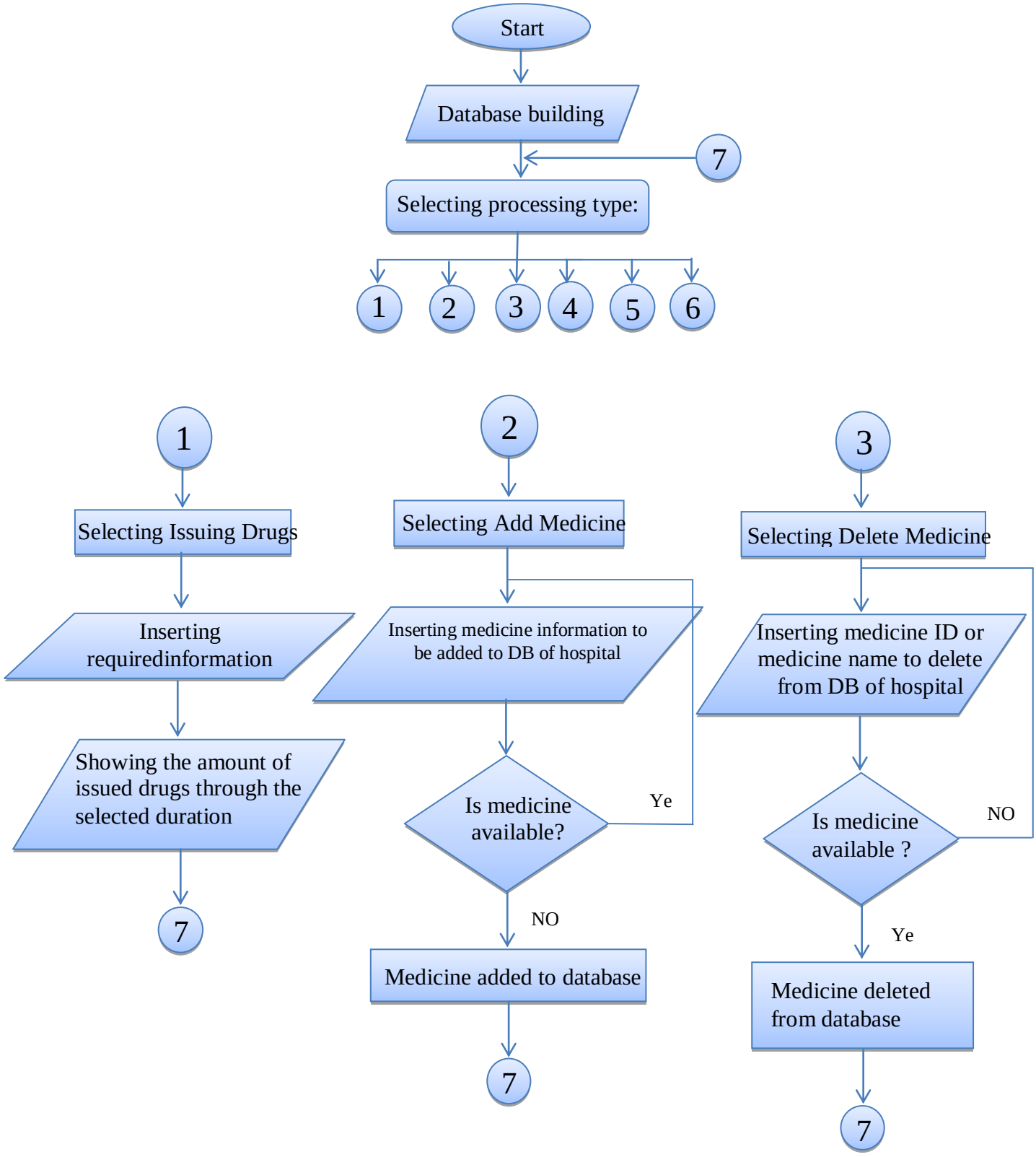
☐Adding medicine: This process is used to insert new record to the "medicine" table.

☐Deleting medicine: This process is used to delete record from the "medicine" table.

☐Searching and editing: This process is done on the records that are already included in the database. To find the required record, a medicine ID or name can be used. This process can easily edit any field of the whole profile.

☐Ordering: This process is used to show all the medicines in the local pharmacy that have quantity less than 20% of maximum quantity, and it is used for sending order to the related warehouse.

☐Receiving order: This process is used to receive the response of warehouse regarding issuing drugs.



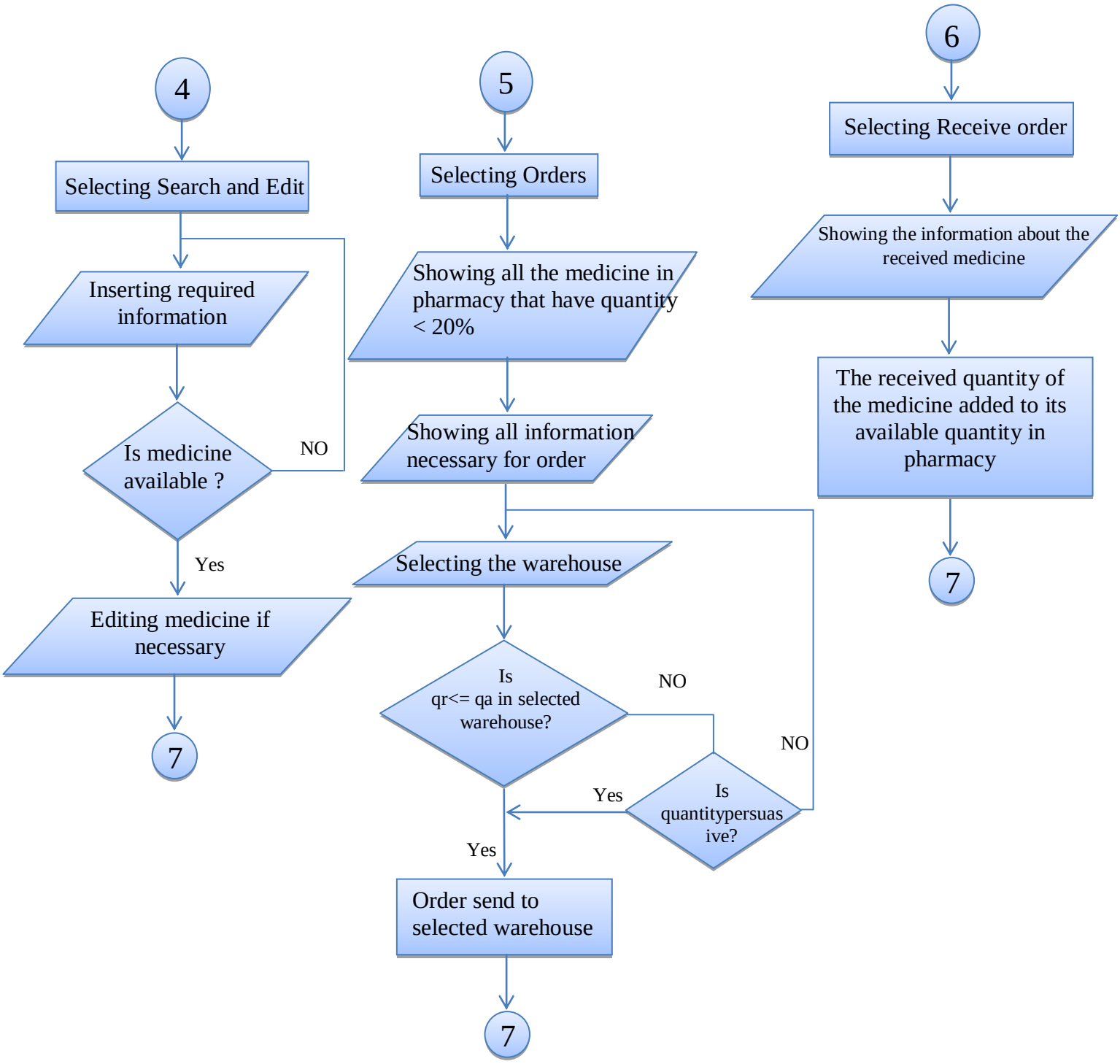


Fig. (2). Flowchart of the pharmacy algorithm

The proposed algorithm of drug warehouse composes of five main processes which are explained in the Figure (3) as a flowchart. These processes are: ordering, adding medicine, deleting medicine, searching and editing and reporting, as:

☐Ordering: This process is used to receive the orders from pharmacy to be responded by sending the requiredquantity by the pharmacy if available. In case of unavailability, a part of quantity is provided until the left can be compensated.

☐Adding medicine: This process is used to insert new record to the "medicine_warehouse" table, and it is similar to adding medicine process explained in Figure (2).

☐Deleting medicine: This process is used to delete record from the "medicine_warehouse" table, and it similar to deleting medicine process shown in Figure (2).

☐Searching and Editing: To find the required record, a medicine ID or name of the required record can be used. This process is similar to searching and editing process shown in Figure (2).

☐Reporting: This process is used to show the amount of issued drugs for the one of hospitals related to the system through week, month and year, and it similar to Issued Drugs process shown in Figure (2).

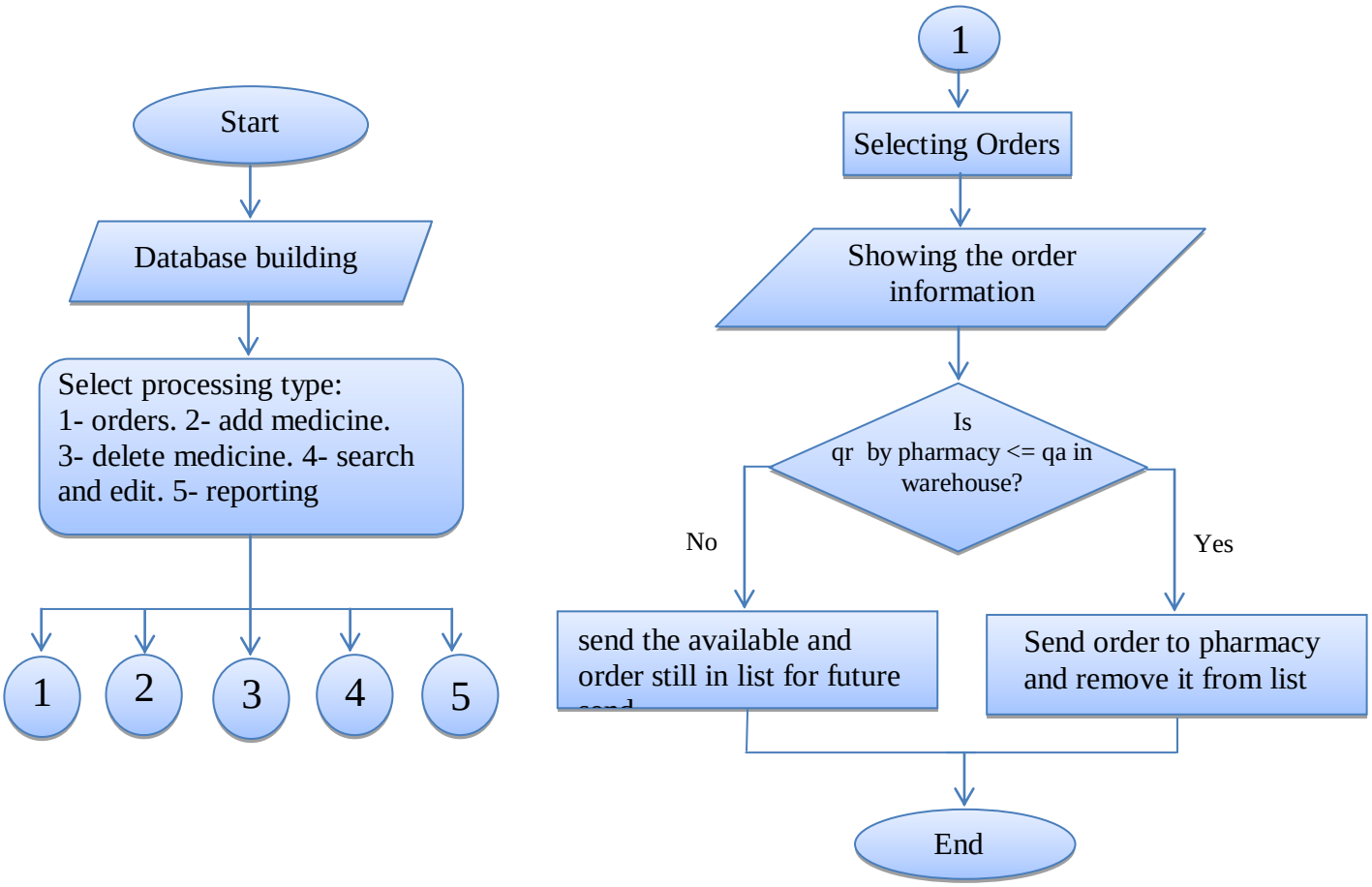


Fig. (3): Flowchart of the warehouse of drugs proposed algorithm

IV. DATABASE BUILDING

MySQL is a quick and simple method of utilizing the Relational Database Management Systems (RDBMS) used for different categorizes of organizations [5]. MySQL is turning out to be so prominent as a result of numerous great reasons: scalability and adaptability, high performance, strong data protection, high availability and robust transactional support [6].

In this paper, a database utilizing MySQL, called "hospital" is built that contains the considered tables related to the local pharmacies and warehouses. For the medicine in pharmacy, a built table with name of "medicine" that includes
7 columns as shown in Figure (4). These columns includes the hospital name, medicine ID, average quantity for each medicine, the maximum quantity of each medicine, the cost and expiry dates.

On the other hand, the warehouse of drugs related to the proposed system has owned a table called "medicine_warehouse", that contains 5 columns of the involved information as shown in Figure (5), which are ID, name, average quantity, cost and expiry date of each medicine.

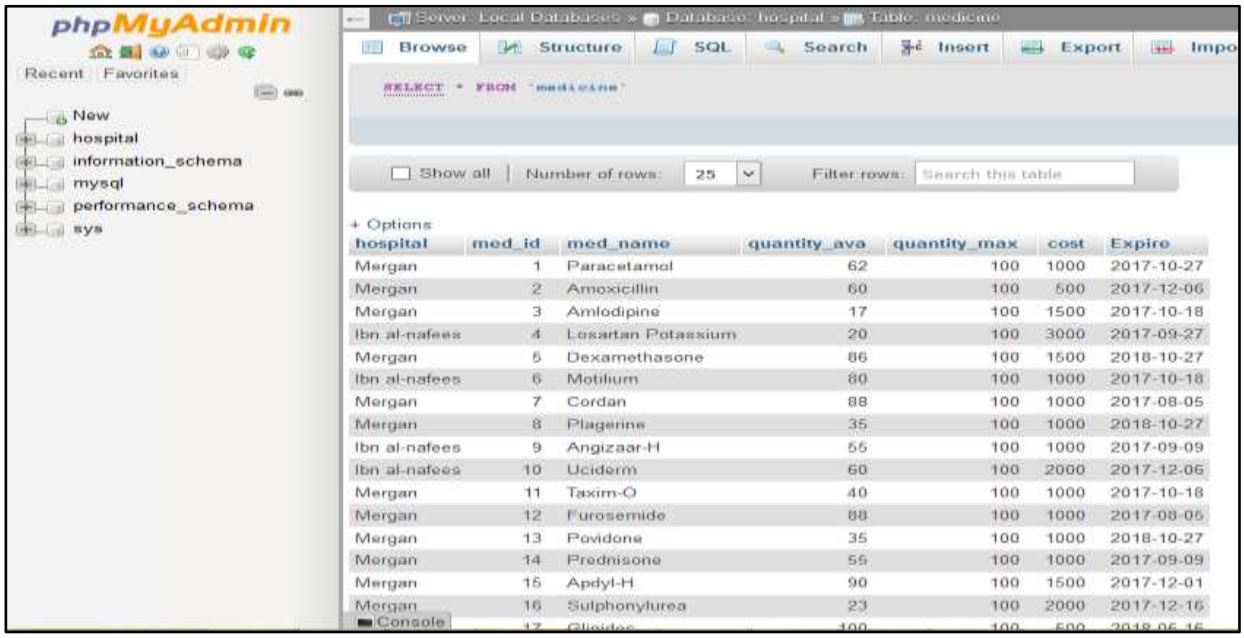


Fig. (4): Medicine table.

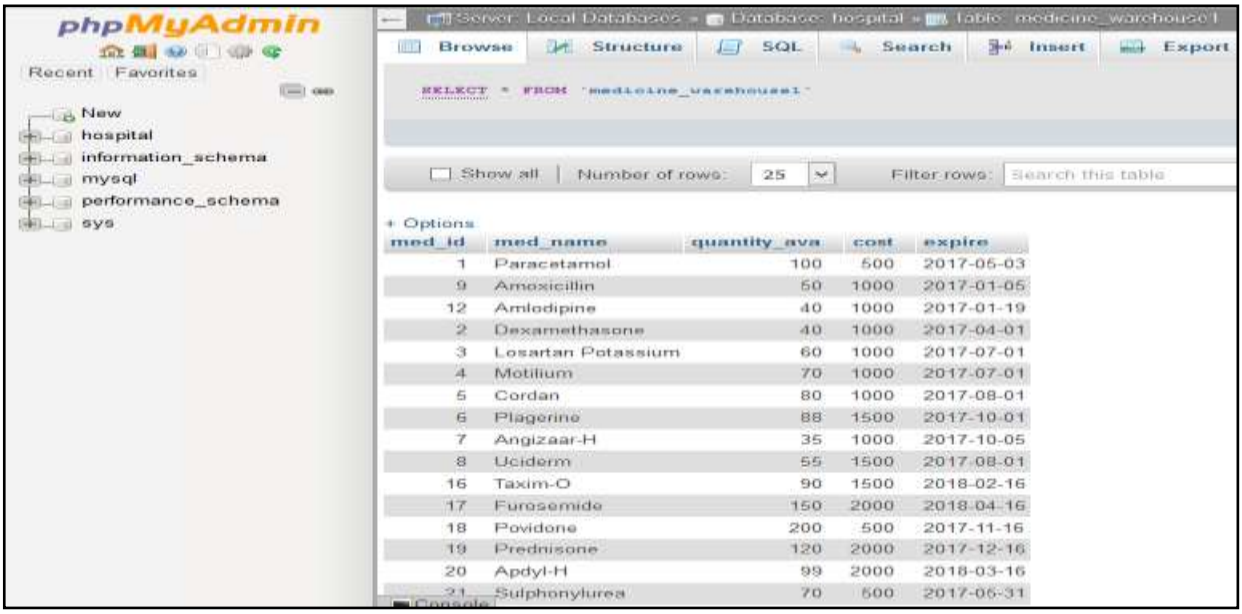


Fig. (5): Medicine_warehouse table.

V. GUI DESIGN

The GUI of the proposed system is designed and implemented using HTML and CSS environments. Figure (6) shows the pharmacy home page which includes the menu that creates links to other pages for different processes. Figure (7) shows the issuing drugs process that is working statistically for a specific medicine and time. Therefore, it helps the pharmacy and warehouse to know amount of drugs needed as average as explained below:

- Selecting the hospital, inserting the medicine name and selecting the duration.
- On click Search, the system shows the amount of issuing the selected hospital, medicine and duration.

Fig. (6). Pharmacy home page

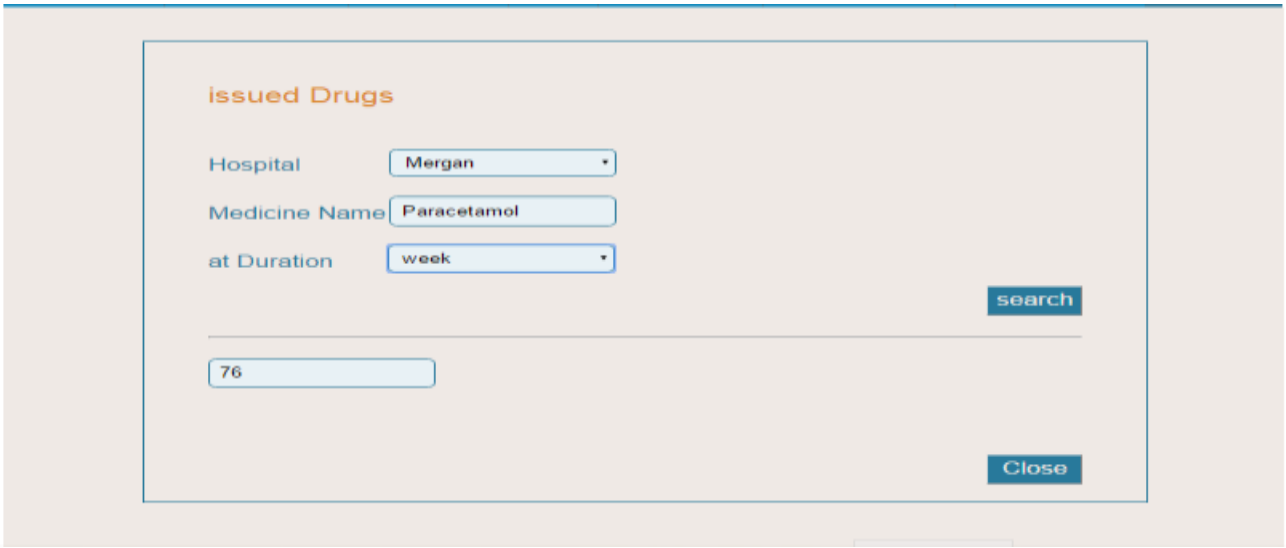


Fig. (7). Issuing Drugs page

The adding medicine process is performed, as shown in Figure (8), by inserting all the required information and clicking "ADD" button; the inserted information is stored in the database.

Fig. (8): Adding medicine page

The deleting medicine process is done by inserting medicine name or ID and then clicking the "Delete" button to delete medicine from "medicine" table. The system can also delete all expired medicine automatically to increase the system efficiency and ensure patient's safety.

The Search and Edit process is done by selecting the hospital and medicine ID or name. For example if medicine ID=2, the result of the searching process is shown in Figure (9). Each field can be edited easily.

Fig. (9): Searching and editing page

Figure (10) shows the warehouse of drugs home page which includes the required links represented as a menu buttons to other processes. For example, Figure (11) shows the add medicine process in warehouse of drugs that inserts a medicine to "medicine_warehouse" table.

Fig. (10): Warehouse of drugs home page

Fig. (11): Add Medicine page in warehouse

VI. RESULTS

The proposed system is tested by sending an order of a medicine in the pharmacy with quantity less than 20% of the maximum quantity to warehouse and then receiving the response. Figure (12) shows the ordering page in pharmacy webpage which includes a list of the medicines need to be ordered.

The procedure of ordering a medicine by a local pharmacy can be summarized as:

- When the user clicks on Order button the required information about each order is showed at the fields. The user is required to select the warehouse of drugs.
- When the user selects the warehouse and clicks Order, then the system sends the order to the related warehouse.

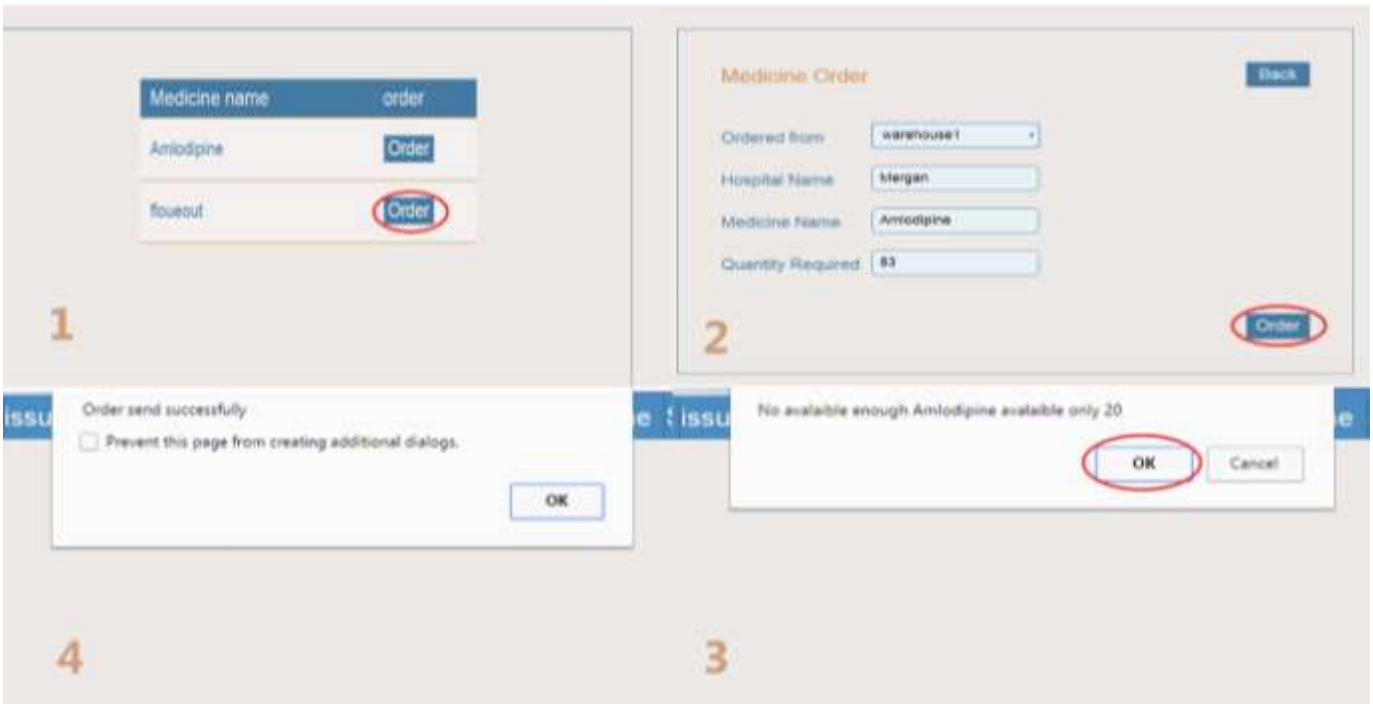


Fig. (12): Orders page in pharmacy

Figure (13) explains the ordering page at the warehouse webpage that includes a list of all orders come from related pharmacies. The following steps explain the procedure of warehouse performance:

• By clicking one of items from list, the related information is shown regarding the order, such as: from which hospital, medicine name and required quantity.

• By clicking the issuing order, the system checks the requested quantity and the availability.

• In case of the required order includes quantity of a medicine is larger or equal to the available, then the order is performed and removed from the order list.

• If the requested quantity of a medicine is smaller than the available, then the system sends back the available quantity to the pharmacy and subtracts it from the order. The order is not removed from list till compensating the left quantity.

Fig. (13): Orders page in warehouse

Figure (14) illustrates the receiving order page in pharmacy webpage which includes a list of received orders. From the list, we can choose an order to view the related information, such as the received medicine and its quantity as well as the name of warehouse. The process of adding the received medicine to the relative by increasing the quantity after clicking OK button.

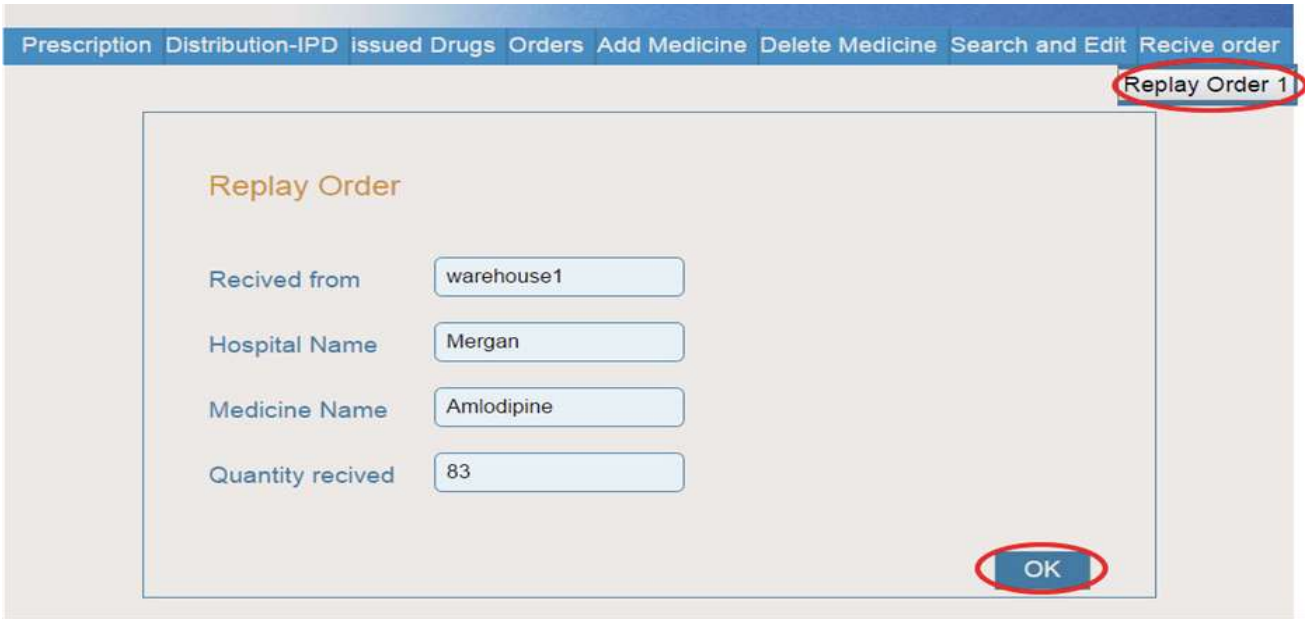


Fig. (14): Receive order page

VII. CONCLUSION

An e-pharmacy warehousing management system has been proposed based on database and website pages. The main job of the proposed system was to manage the medicine transfer between the local pharmacies and related warehouses. This was done throughout a master database that control the processes and actions on individual parts. In addition, the system fully worked automatically in terms of ordering and monitoring the quantity and expired dates of medicines. The proposed system consists of two main parts that are website and database. The website is designed using PHP, HTML and CSS environments, while the database is built utilizing MySQL environment. The website pages is used as a GUI to ease the interfacing with the system by users. All the information is stored in different tables in the database in order to prepare the required reports and other benefits. The results showed that the proposed system has achieved high performance and accuracy.

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