Pet Health Care System

نظام الرعاية الصحية للحيوانات الاليفة

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Abstract

With the massive success of electronic health care applications and with emerging technologies in the areas of telecommunications which are widely used in healthcare sector, a reliable system to serve Pet Owners and Veterinarians will be designed and implemented in this paper. Pet's medical condition should be evaluated by a veterinarian before any medical decisions will be implemented. The proposed system, Pet Health Care System (PHCS), will be helpful to the specialists in the field of Veterinary Health Care. It centralizes database which contains the pet records. The system will enable the Vet to access the database and show the pet details to diagnose their medical condition and write the required treatment. PHCS is considered an efficient system to reduce healthcare costs and provide the time. It offers veterinarians an exciting way to make the service of pets owners more better. It helps the Owners of the unhealthy Pets to have more accurate information about the date of their pets' pathological status.

الخلاصة

مع النجاح الهائل في تطبيقات الرعاية الصحية الالكترونية ومع تطور التكنولوجيا في مجالات الاتصالات السلكية واللاسلكية والتي تستخدم على نطاق واسع في قطاع الرعاية الصحية. نظام موثوق لخدمة مالكي الحيوانات الأليفة والأطباء البيطريين سيصمم ويطبق في هذه الورقة. الحالة الصحية للحيوانات الأليفة يجب أن تقيم من قبل طبيب بيطري قبل أن يتخذ أي قرارات طبية تخص الحالة. النظام المقترح (نظام الرعاية الصحية للحيوانات الأليفة) مفيد للمختصين في مجال العناية الصحية البيطرية. هو قاعدة بيانات مركزية تحتوي على سجلات الحيوانات الأليفة لتشخيص حالتهم المرضية وتحديد العلاج المطلوب. يعتبر نظام الرعاية الصحية للحيوانات الأليفة كفوء للحد من تكاليف الرعاية الصحية وتوفير الوقت، حيث انه يزود الأطباء البيطريين بوسيلة فعالة لتقديم خدمة أفضل لمالكي الحيوانات الأليفة. فهو يساعدهم بالحصول على معلومات أكثر دقة حول الحالة المرضية لحيواناتهم الأليفة.

Keywords: PHCS, Pet, Veterinarians, EMRS, Healthcare, MoSCoW, Prototype.

1. Introduction

In line with the technological developments in various areas of life, the computer science is developing rapidly and spreading widely in all the fields. As a result, the computer has become the backbone of almost business. Healthcare sector is one of these fields influenced by this development and Electronic Medical Record Systems (EMRS) of Pet is an example of that [1]. This development is used by creating an electronic health record which helps Pet's Owners and Veterinarians to provide better care for pets. In this research, a system will be build based on an electronic healthcare technology which has many significant features for pet's records management to save time for busy veterinarians, nurses, and pet's owners [2]. Pet Health Care System will follow-up the Pets' medical condition and prescribe the suitable treatment. By using these systems, the accuracy and quality of care will be improved, while the healthcare cost will be lower [3].

1.1 Related Works

Several studies have been emerged for supporting the field of Pet's Healthcare; among these studies, a systematic framework in a health care application has been designed for an access to communication and a pattern to run physical exams, diagnosis and medication procedures [4]. Another study has suggested "Cost-effectiveness analysis of strategies introducing FDG-PET into

the mediastinal staging of non-small-cell lung cancer from the French healthcare system perspective"[5]. Also, there is a study evaluates the performance characteristics of the eXplore VISTA dual-ring small-animal PET scanner [6]. While Pet Health Care System provides Veterinarians with extremely accurate information to follow up the Pets' medical condition and prescribe the required treatment.

1.2 System Goals

The aim of the proposed system (PHCS) is to serve health care of Veterinary by enabling the Veterinarians to access the database of the system**,** show the Pets records to diagnose their medical condition and prescribe the required treatment. It provides Vets the opportunity to directly have an access to the information on conditions treated and care provided so future care can be based on extremely accurate information. In addition it is capable to reduce healthcare costs, enhance communication between Owner Pet and Vet and manage the medical data in support of evidence-based medicine, scientific and statistical research purposes.

1.3 System Overview

To start- up any system, there are essential objectives, purposes and requirements that should be known. During foundation stage of (PHCS); several things should be obtained like: more understanding of the requirements, priorities, calculating, formulating a realistic time boxed plan, fair understanding to the system scope and estimating the budget [7].

This work is to build a system based electronic healthcare technologies to serve Veterinary clinics and Pets Owners [8, 9]. The database of this system stores details of the users related to the system and details of Pets Owners with their unhealthy Pets. When a Pet Owner first contacts a clinic of veterinary, the details of the Pet's Owners and their pets are recorded and the details of an appointment with the Vet also are noted. PHCS has several users which were identified as: nurse, vet, secretary and admin and each one has collection of functions. The nurse or secretary has the ability to register, login, log out, add- edit account of pets and their owners, add details of an appointment with the vet, and search the pet record by their owner's names. While the Vet is able to register, login, log out, search Pets' Owners, diagnosis the pets' medical condition, and write the medical prescription. Likewise the administrator has full access to the system, and monitoring the system activity, figure (1) illustrates the work flow of PHCS.

Fig.1: Work flow of Pet Health Care System

2. Identifying the requirements

Requirement is a service, feature or function that the user desires the solution to present or display. The system should meet both user requirements and business needs. These requirements should be flexible according to the business needs [10]. In PHCS, two types of requirements should be taken into account: the first type is functional requirements which mean what is the system you want to do? They are identifying the key characters of the solution. During foundation stage of this system, more understanding for the requirements, priorities, calculating, formulating a realistic time boxed plan, fair understanding to the project scope and estimation should be obtained. The second type of requirements of PHCS is non-functional requirements which describes what level, with what security, usability, performance, reliability, maintainability and legislative. For having a lot of information that could be useful to apply PHCS, we had an unstructured interviews with specialists in the field of the Veterinary Health Care to identify the system requirements according to the priorities. This priority will be applied by using MoSCoW Prioritisation [11]. To implement MoSCoW technique on this system, these words will be used : Must have, Should have, Could have, and Won't have. Table (1) shows the Prioritised Requirements List according to using MoSCoW Prioritisation of PHCS.

Table 1: Prioritised Requirements List of PHCS

Requirements	(M, S,C,W)
Register pets owners	M
Add pet details	M
Provide access to a database	M
Input staff information	S
List all staff at a clinic	S
Input appointments details of diagnosis	M
Report on historical appointments	C
Diagnosis the pet medical condition	M
Add treatment	M
Print the medical prescription	S
Document the history of pathological cases of pet	S

3. Prototypes of the system

The prototypes of PHCS to be developed and the classes of users to be involved in their development described as in the table (2).

Table 2: Prototypes of PHCS

Requirements	Prototype group	prototype name	Type	Access Level
Register pets owners (vet, nurse, secretary) account	A	Pet owner	Form	Secretary, Nurse, and System Administrator
Input pet details		Pet	Form	Secretary, Nurse, and System Administrator
Diagnosis the pet medical condition and add treatment	B	Diagnosis and treatment details	Form	Vet
Print the medical prescription		Medical prescription	Report	Vet
Input staff information	C	Staff	Form	Secretary and System Admn.
List all staff at a clinic		Staff	Report	Secretary and System Admn.
Provide access to a system database	D	Database of a clinic		System Administrator
Input appointment details of diagnosis	E	Appointment	Form	Secretary and System Admn.
Document the pathological cases of the pet		Pathological cases	Report	Vet

Justification:

- ***Prototype group A:*** It contains all of the input information of unhealthy pet and pet owner for making appointment.
- ***Prototype group B*:** It contains the diagnosis of the pet disease, add treatment and report the medical prescription.
- ***Prototype group C*:** It contains all of the input information of the staff in a veterinary clinic.
- ***Prototype group D:*** It is related to security of the database.
- ***Prototype group E:*** It is a report for making the historical appointments and documenting the history of pathological cases.

4. User Involvement

The principle of collective action is the basis for the success of any system. It focuses on how people can work together efficiently as a team, why responsibilities and roles are distributed to each person in a system team. This cooperation is helping to overcome any obstacle to the success of the system.

Roles of users in PHCS are identified among the system team like: system administrator, technician, analyser, designer, and end users who related to use of the system according to their responsibilities with the system [12]. In PHCS, the team will work together to achieve the target of the system and the users are distributed according to their roles. In this system some users have only access level control, but the system administrators have completed access level. Table 3 shows tasks of PHCS users.

Table 3: Tasks of PHCS Users

User	Tasks	Description
Secretary	1. Access to the system after enter their username and password, 2. Add- Edit account of pet details and pet owner, 3. Add details of an appointment date and time with the vet.	- Input the pet owner details, - Input the pet details, - Edit the pet owner details, -Take appointment with the vet.
Nurse	1. Access to the system after enter their username and password, 2. Review the pets' records by searching their owners and review history of pet cases.	- Input the pet owner details, - Input the pet details, - Edit the pet owner details, -Take appointment with the vet, - Search the pet record by their owner's names.
Vet	1. Access to the system after enter their username and password, 2. Review the pets' records by searching their owners and review history of pet cases.	- Diagnosis the pet medical condition, - Input the disease name, - Input medicinal drug, - Document any note related to the state, - Print the medicinal prescription.
System Admin	1. Add-edit user like vet, nurse, and secretary, 2. Monitor the system activity, security, performance and system backup.	- Maintain System and database, - System Backup.
Technician	Provide technical support	- Maintain system and database.

5. Proposed System Design

System design phase is considered complementary to the analysis phase and the main goal of them is to improve organizational systems. The design stage describes desired features and operations in detail, including interface layouts, process diagrams and business rules. On the other words, its purpose is to create a technical solution which satisfies the functional requirements of the system [13]. Use Case Model, and Use Case specification were used to design the PHCS. The Use Case Model represents a discrete unit of interaction between a user and the system. Each use case describes functionality that will be built in the proposed system [14]. Whereas Use Case Specification provides a way to capture the functional requirements of a system counting event trigger and expected outputs. In PHCS, there are five users in the Use Case Diagram and each one has many functions in the system as shown in table 3.

In the design of PHCS database three main phases are used: conceptual, logical and physical design. The first phase describes the relation and the connectivity among all components of the system. While the second phase which driven by the conceptual data model, it consists of particular classes that will become tables whilst their attributes will become fields and the associations will become relationships. And the final phase is to translate the logical database into a physical database [15].

MySQL database was implemented in the design of PHCS database. While Visual Studio and Web Browser Applications were used to create stand alone desktop applications. C# language Also was used in implementation phase of this system [16]

However, In PHCS many drawings have been created and transferred to Entity Relationship Diagram (ERD) as shown in figure (2).

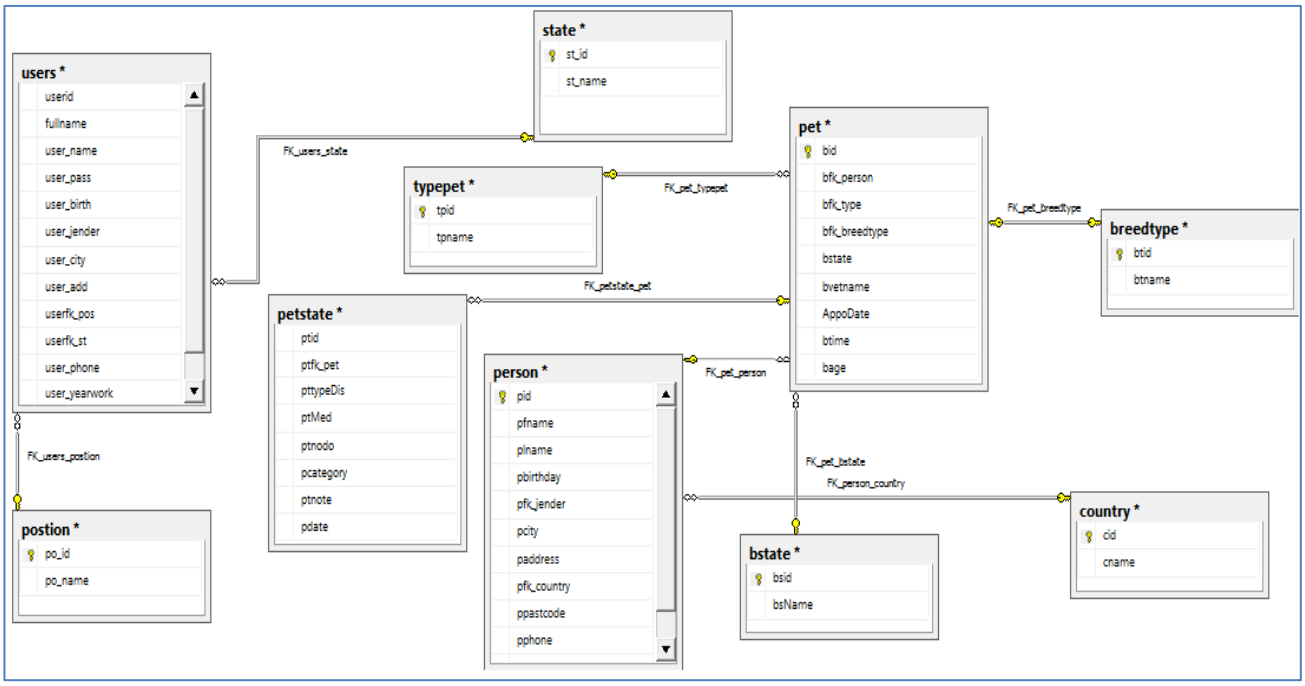

Fig.2 : Entity Relationship Diagram of (PHCS) database

6. System Results

The system interfaces that have been obtained through the implementation of PHCS as following:
1.Figure (3) shows login page for nurse while figure (4) shows the main page of the system which includes four options related to the main page of (PHCS).

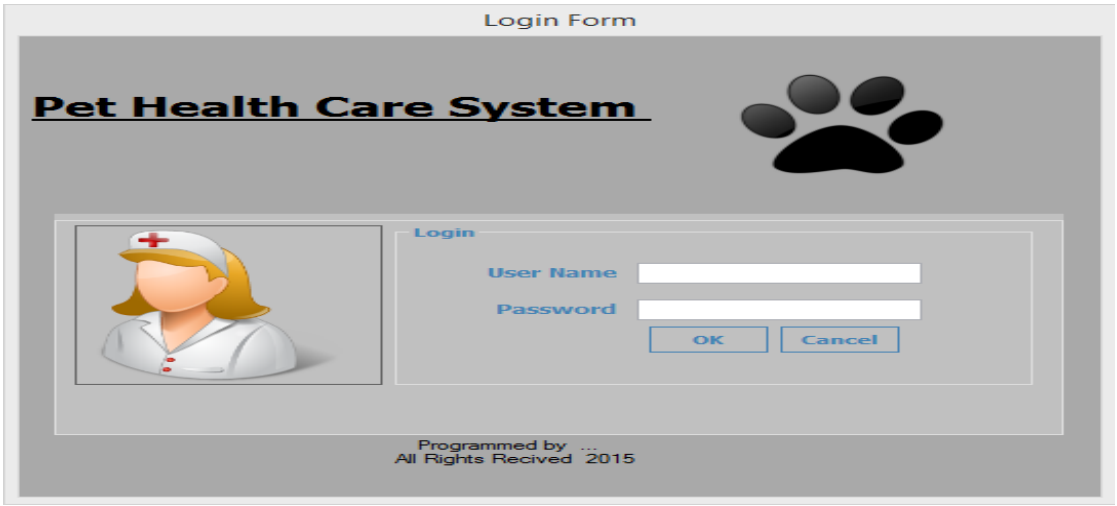

Fig. 3: Login page for nurse

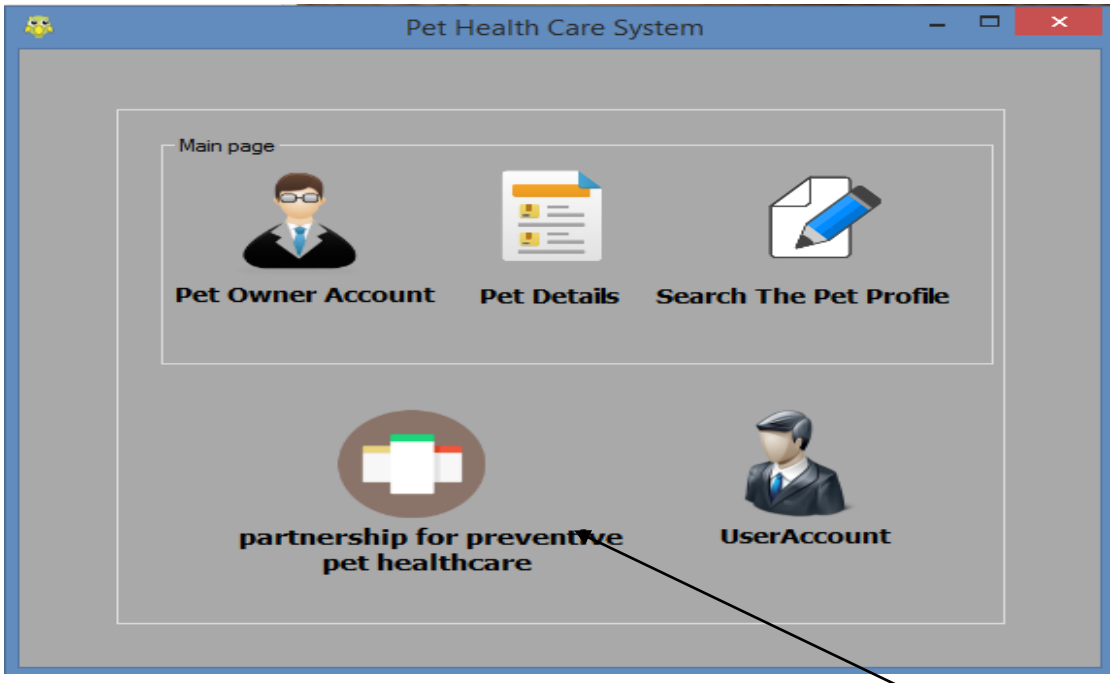

Fig. 4: Main page of PHCS

1. Figure (5) shows page of adding pet owner account while figure (6) shows the process of adding the pet owner account was successfully.

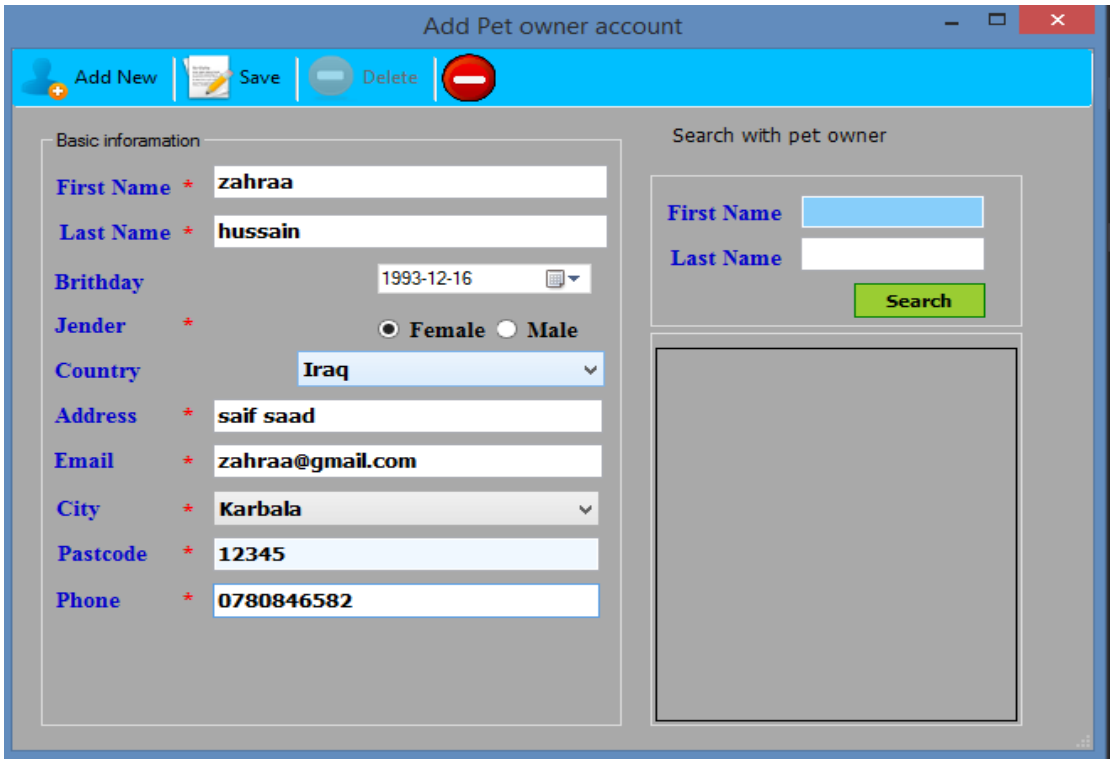

Fig. 5: Adding pet owner account

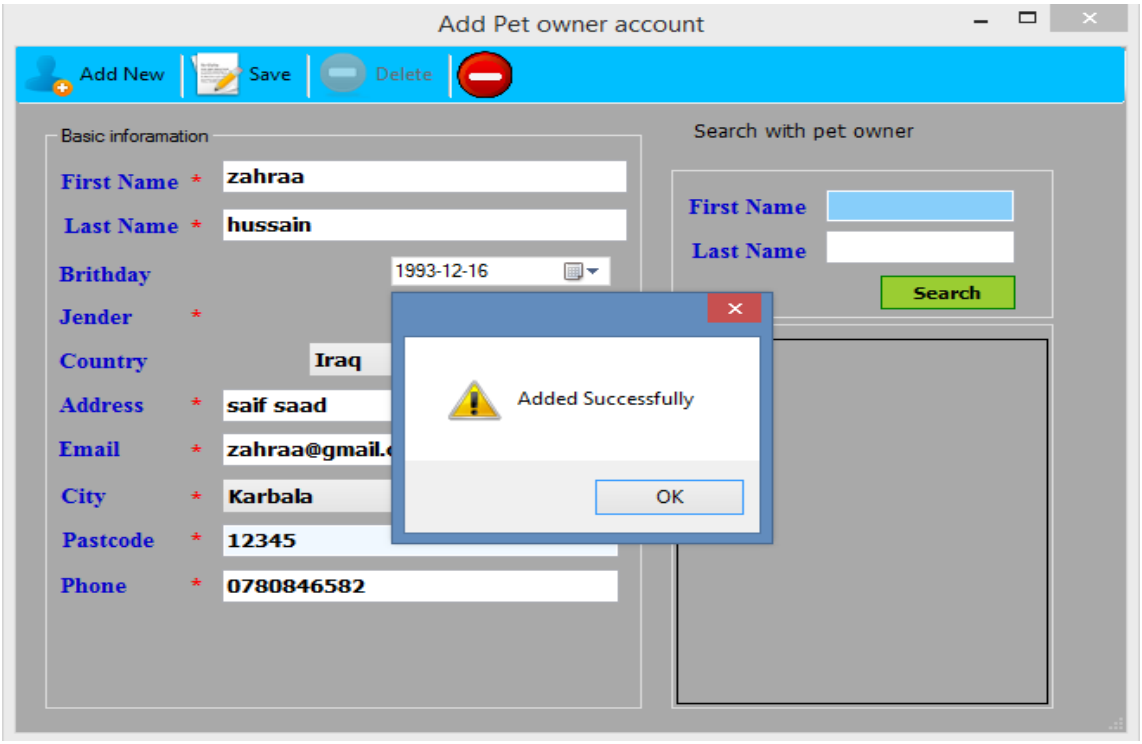

Fig. 6: Success of adding the pet owner account

3. After adding the pet owner account, the system should save also the pet details belong to its owner. The nurse will select the option (pet details) from the main page for entering the pet information in page of add pet details according to its owner name as shown in figures (7, 8). While figure (9) shows the process of adding pet details was successfully.

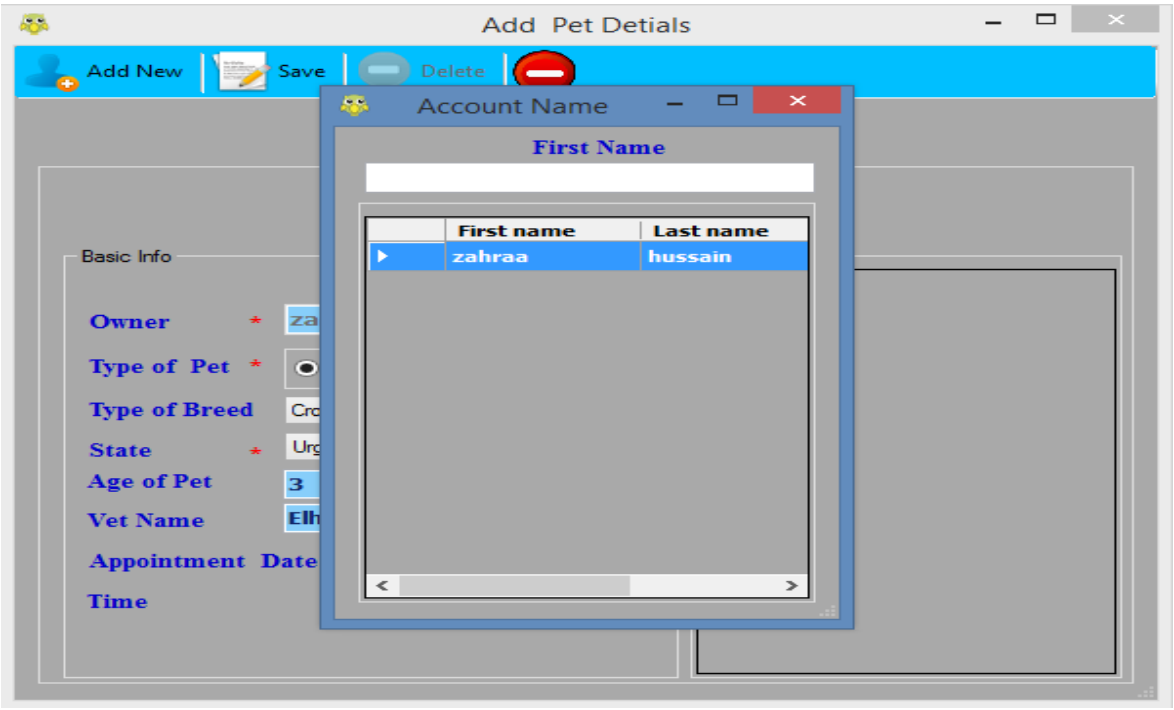

Fig. 7: Page of adding pet details

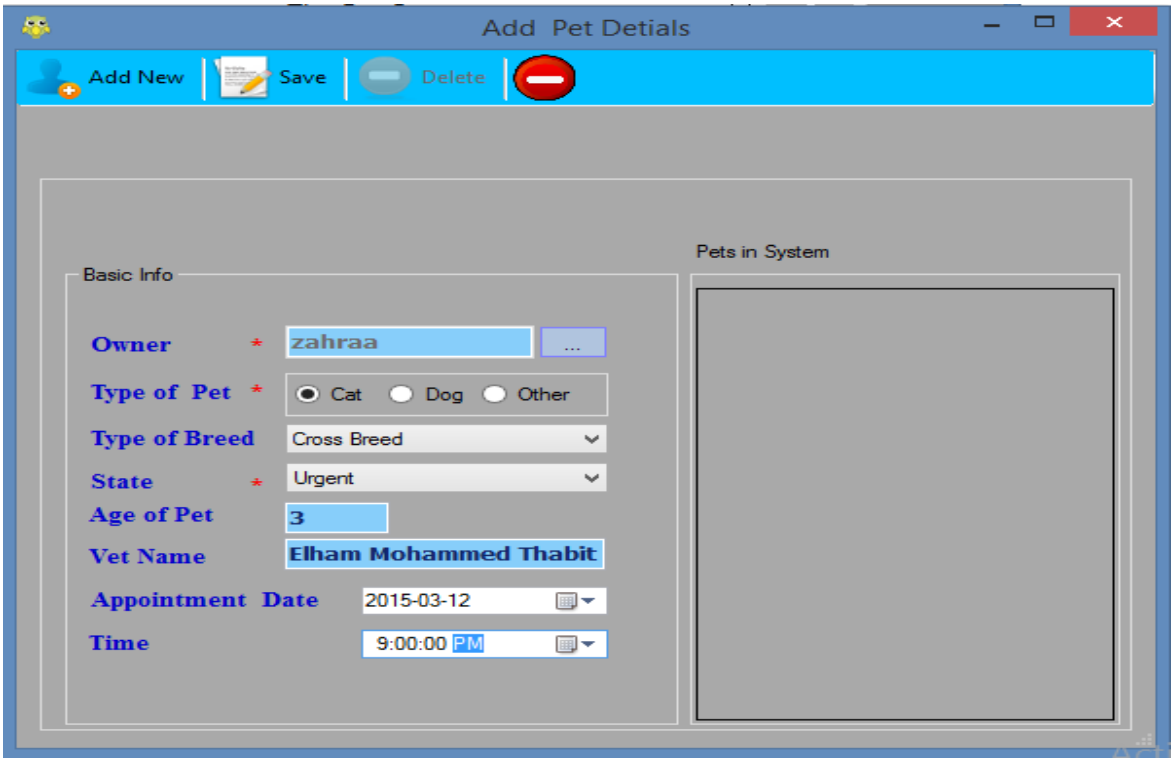

Fig. 8: Page of adding pet details

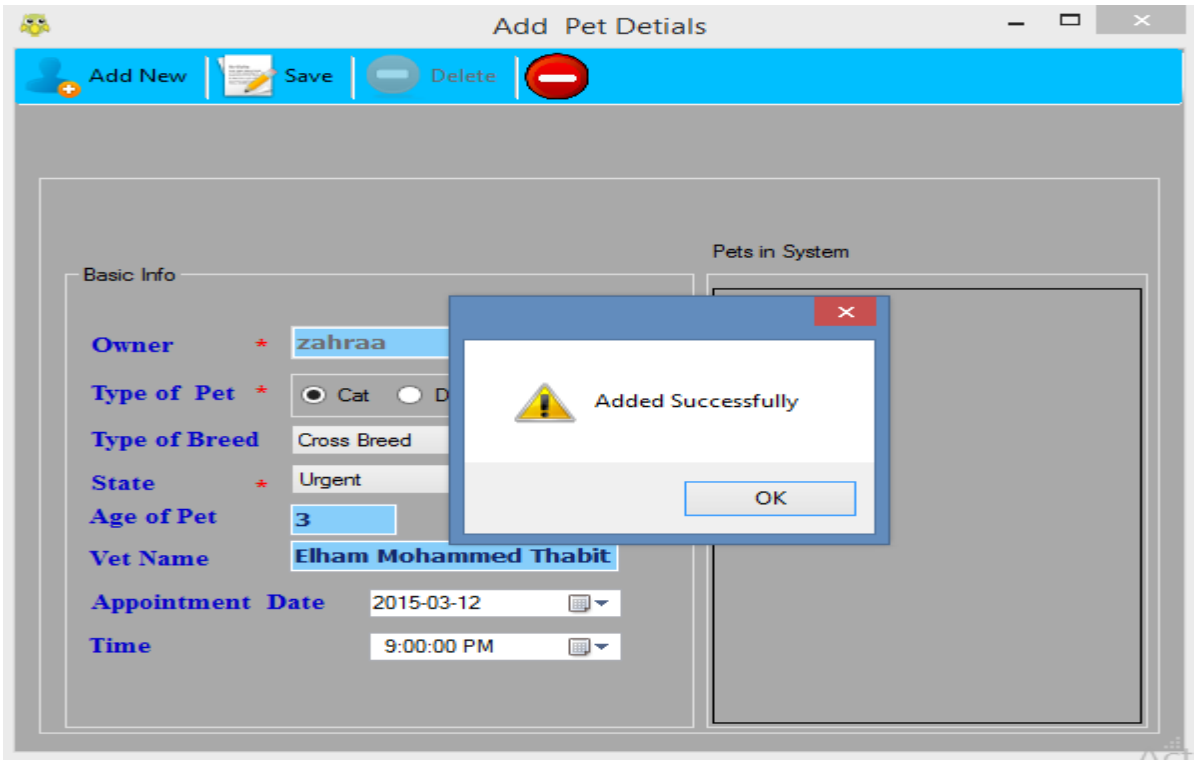

Fig. 9: Success of adding the pet details

4. Figure (10) shows the page of searching the pet owner name, while figure (11) shows the diagnosis of Pet's medical condition which will be filled by the vet.

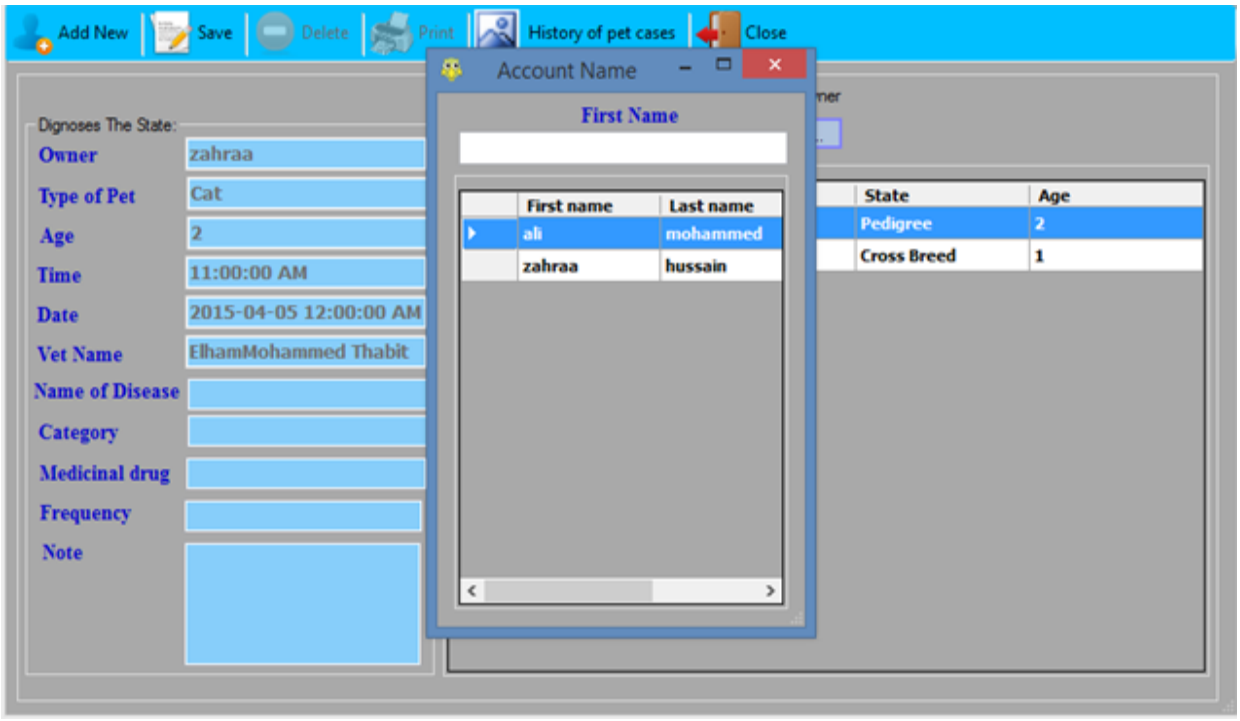

Fig. 10: Page of searching pet's owner name

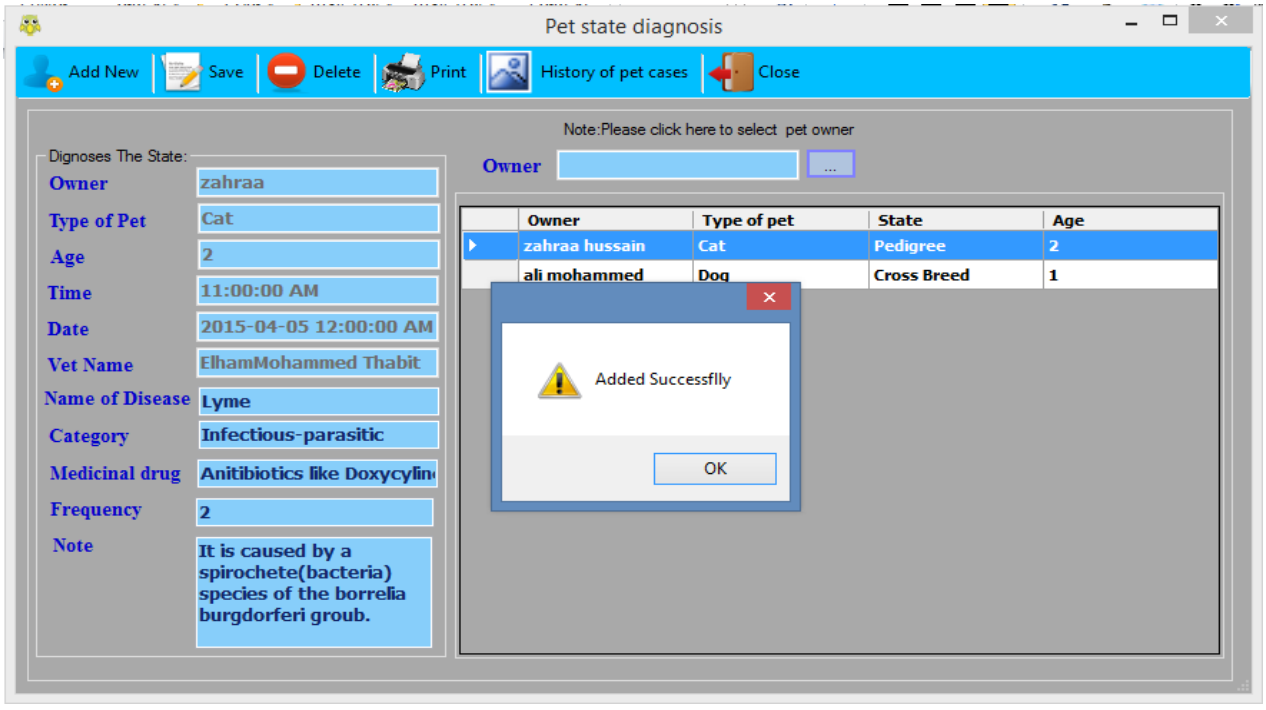

Fig. 11: Page of adding the disease name and medicinal drug

5. Figure (12) shows the medical prescription which will print after the vet press on the print option in page of pet state diagnosis.

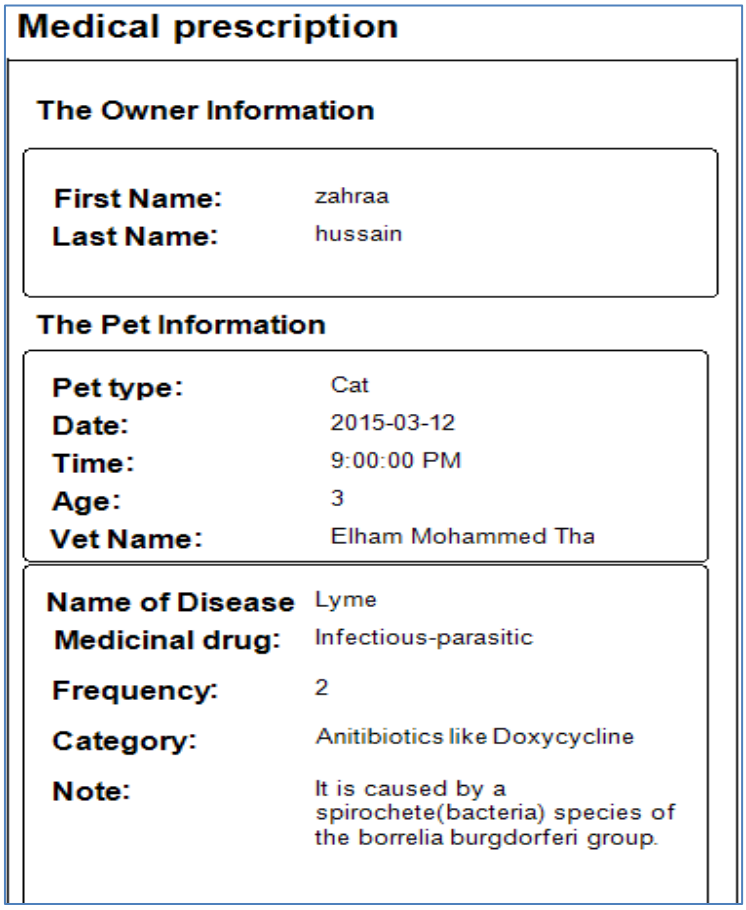

Fig. 12: Medical prescription

6. When the Vet wants to know the pathological cases of unhealthy pet, he will search of the Pet Owner to show all pathological cases of pet as shown in figures (13,14).

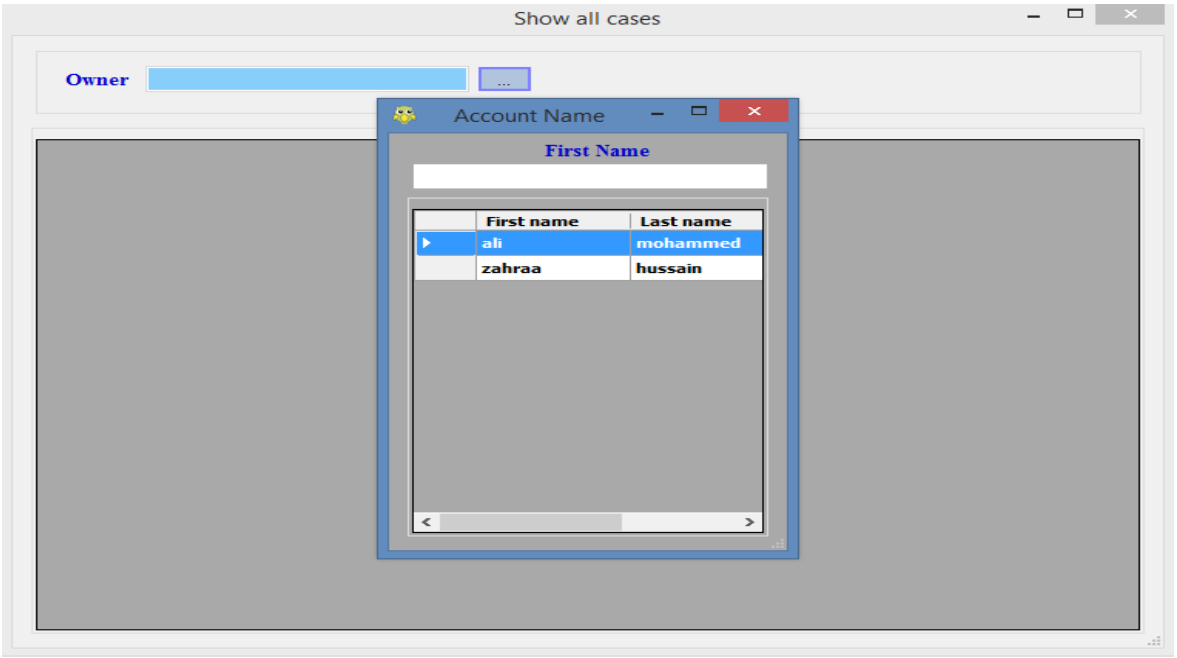

Fig. 13: Page of pet's pathological cases by it's owner searching

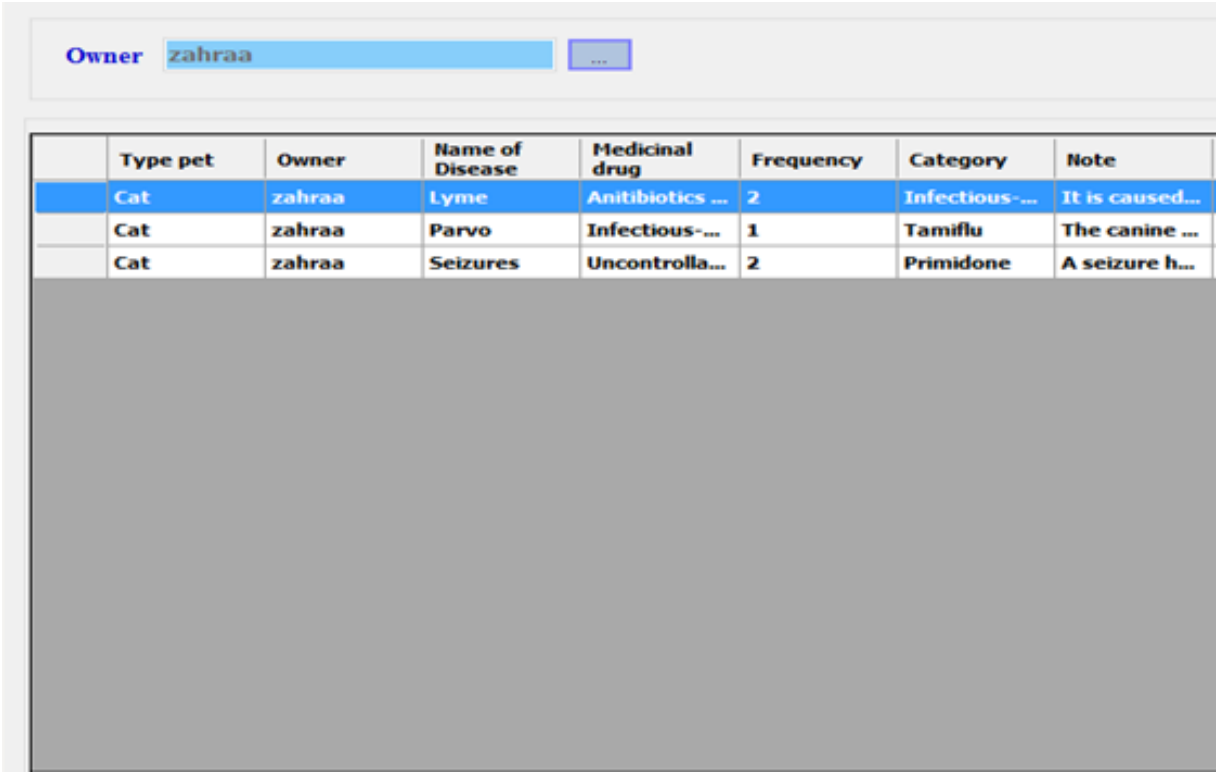

Fig. 14: Page of all pet's pathological cases

7. Conclusion

To sum up, E-health applications will support and increase collaborative work and group awareness. Moreover, it will increase the health awareness and will improve the effectivity of decision making. This paper has presented an implementation of a reliable Electronic System of Pet Record Management which regarded as a centralized database containing Pet's record. It is considered an efficient system for the specialists veterinarians in Health Care. It provides them the opportunity for direct access to the information about statuses treated and care provided. In other words, future care can be based on extremely accurate information.

Overall, after implementing Health Care Pet System; the following conclusions can be drawn from the findings stated above.

1. PHCS is a system used to enhance the provided services for Pets by making their records available to their Veterinarians.
2. PHCS serves to follow up the information about Pets' medical condition and their health history with less effort.
3. PHCS has the possibility of developing a report for each pet's status in veterinary clinics.
4. Clinic director can follow the Vet work related to pets from diagnosis and follow up.
5. PHCS has an advantage to reduce healthcare costs.
6. It ensures the dependability, securing and privacy.
7. It archives the papers-based pet records and maintains them of being damaged and stolen.

8. Future Work

The future improvements to the PHCS are the following:

1. PHCS should be effective and has a high level of performance.
2. Applying the feature of online health record in the system.
3. Enabling the Pets Owners to access the system for having an appointment at the veterinary clinics.
4. Contacting Pet owner directly every month to get their feedback on PHCS.Lastly, we can benefit from this system with its proposed technologies and tools to apply it in veterinary clinics in Iraq which have no E-Health Care System for managing Pet's health. For instance, applying this system on the cattle in Iraq to keep livestock healthy.

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