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Medical expert system in ambulance car

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Abstract.

Background: The technology plays an important role in every industry as well as in our personal lives, healthcare is definitely one of the most important industries. This merger is responsible for improving and saving countless lives around the world. Medical technology is a vast field where innovation plays an important role in maintaining health. The application of medical technology is becoming commonplace in helping physicians to diagnose diseases. Aims: provide medical advice and assistance to doctors in dealing with the injured, and to provide first aid for certain groups of diseases and injuries that the average person can do alone, and to protect the injured from incorrect that may cause Deterioration rather than cure. Methods: expert systems are a type of AI, which is a software system that can be compared to human experts. Its purpose is mostly advisory. A variety of specialized medical systems tools are available and can act as intelligent assistants to clinicians, assisting in diagnosis, laboratory analysis, treatment protocol, education, and expert system design consisting of a knowledge base, inference engine and user interface for emergency medical services, guidance and assistance to healthcare and patients. The knowledge base in the proposed expert system can be obtained from various sources such as the field expert, questionnaire, and emergency department medical personnel. The expert system will have a wide range of knowledge. Operating with original logic, Prolog is used to perform expert systems in a simpler way. Results: This helps in a faster decision-making process in addition to accelerating recovery for patients and to save effort, time and costs and the proposed system can take advantage of it to teach as well. Conclusion: This study was conducted to discover an AI-based model for improving healthcare for patients.

Keywords: artificial intelligence, expert system, first aid, SWI_prolog, XPCE.

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Introduction

Everyday incidents are a large part of the workday for ambulance and healthcare personnel, their mission at the incident site basically consists of medical treatment and transportation to the hospital [1]. Medical expert system has Symptoms of diseases and their treatment in knowledge base. The information received via the medical expert system is comparable to that provided by a doctor or expert in the field of emergency medicine. The user

or patient is prompted to respond, Finally, the therapy is presented on the screen based on the user or patient responses. The fact that only symptoms submitted by the programmer into the knowledge base are available is a restriction of this medical expert system. As a result, new symptoms and illnesses may be added to the knowledge base at any moment[2],[3].

The Necessity For This Work

The main objective of this research to design an expert system for to provide first aid in an ambulance, and for learn the principles of first aid. Knowledge-based diagnostic systems are also part of the healthcare system, which assist the paramedical staff, medical professionals and patients in a disease diagnosis process and medical emergency treatment[4]. In the early period of a doctor's professional activity, an expert system would confirm helpful in minimizing the troubles that he or she may face due to inexperience. The draw.io program was used to create a planned, as shown in the figure(1).

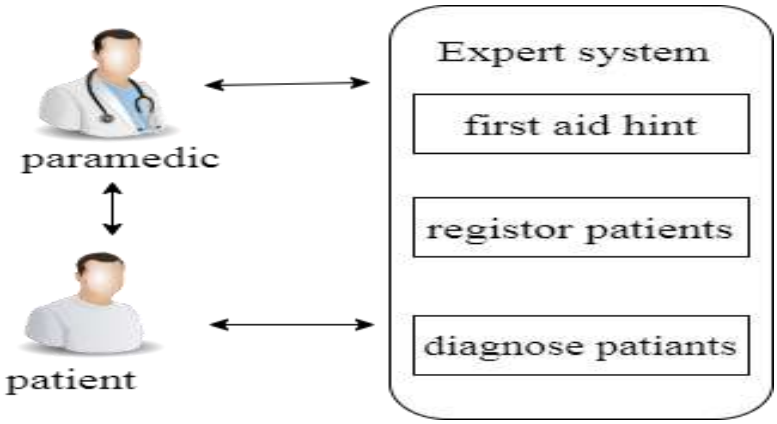

Figure1: The relationship of the expert system, the paramedic, and the patient.

The system plays a role Mentor or guide to the user (the paramedic). To determine the necessary procedures that must be taken for the patient and to avoid medical errors that most paramedics make. The system works from the moment the patient is reached, where the system receives data and this data is information about the patient's condition such as: the general condition of the patient, in addition to determining whether he has a medical history and the patient's vital signs and whether the patient has a specific disease. These written programs, processes, or regulations, as well as the accompanying documentation, relating to the functioning of a computer system and stored in read/write memory. The tool in which the prototype of the expert system is programmed and implemented is the programming language SWI-Prolog to represent the knowledge of the expert, and the XPCE tool that includes SWI-Prolog is used to create a graphical interface with

complementary libraries that help user to interact with the system [5].

Design Medical Expert System In An Ambulance

The system is divided into two parts:

1 First aid procedure
2 Learn first aid

Expert Systems Development Stages

1 Problem Definition : In this stage, the problem will be defined in a clear and specific manner and the nature of the inputs, outputs and objectives to be achieved. In addition to that, the end user and the field expert cooperating in building the system will be identified.

- The problem in the expert system of the ambulance is the process of providing medical advice to properly treat sick cases.
- The system entries are answers to questions that the system poses to the paramedic for the case, which is about the general condition, history and vital signs of the patient, and the complaint he suffers from,
- The outputs of the system are medical instructions and first aid provided by the system in addition to specifying the necessary procedures that must be taken for the patient, As well as writing a report on the patient's condition, sending it to a hospital so that the doctor can view it.
- The end user of the expert system is the medical staff or paramedic who is in the ambulance and performs first aid to the patient after receiving directions from the system.
- Field Expert : Experience in field of emergency medicine has been transferred from a specialist doctor who has experience in this field.

2 System Design: In this stage, we will define the relationships between the parts of the system and the way they interact to solve the problem, and we will show how the information is derived from the expert (the doctor in emergency medicine). In the ambulance process, the expert determines the patient's complaint or the location of the injury and then monitors the patient's vital signs and accordingly takes appropriate measures and determines the necessary aid for the patient. The draw.io program used for following figure(2) shows the method for recognizing the complaint of a medical state.

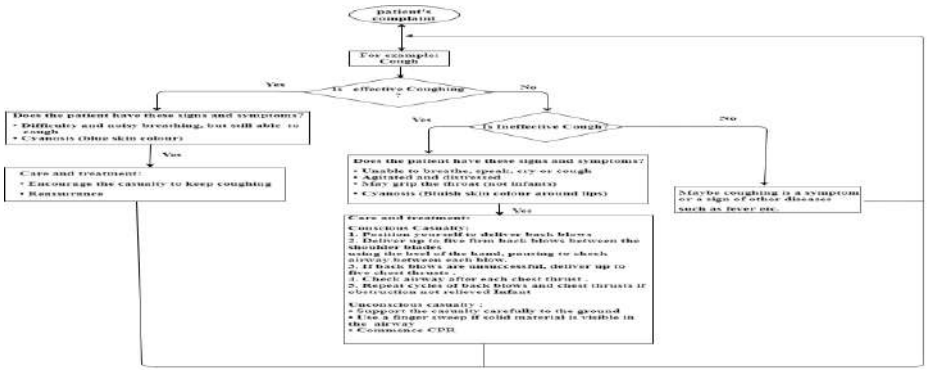

Figure2: the method for recognizing the complaint of a medical state.

3 Formalization: at this stage that the logical design process of the expert system takes place. Usually the information is organized into a form (Tree Structures). The draw.io program was used to create a planned shows the logical sequence of the system's work from the beginning until reaching the goal of the system. In the hierarchy of data, the identification representation of knowledge is used. Flowchart the knowledge derived from emergency medical guidelines and services for the diagnosis and care of patients. The draw.io program used for following figure(3) to create a planned shows the logical sequence of the system.

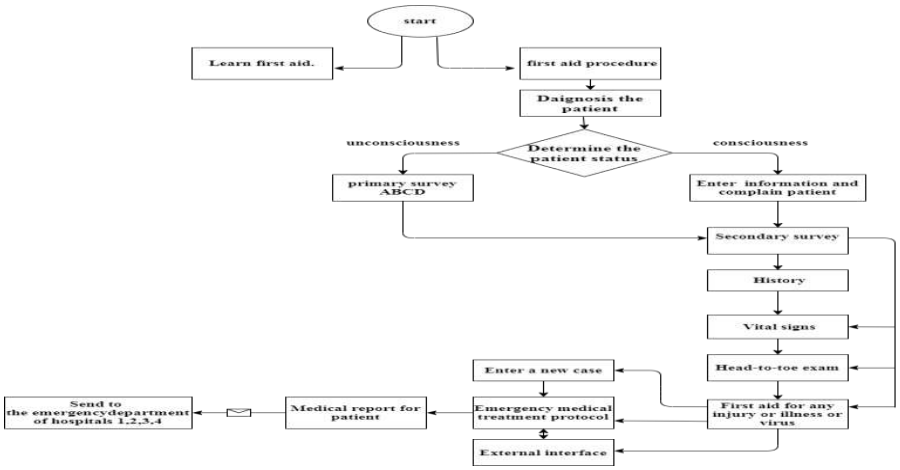

Figure3: The logical sequence of the system.

4 System Implementation: The last stage that the system went through is the implementation stage. This stage is for system interface design. In this interface, data is entered into the expert system, and after entering the data, the result appears, which is a report explaining the required emergency measures.

5 System Validation: phase evaluating the performance , revising the system if required.

Structure of Expert Systems

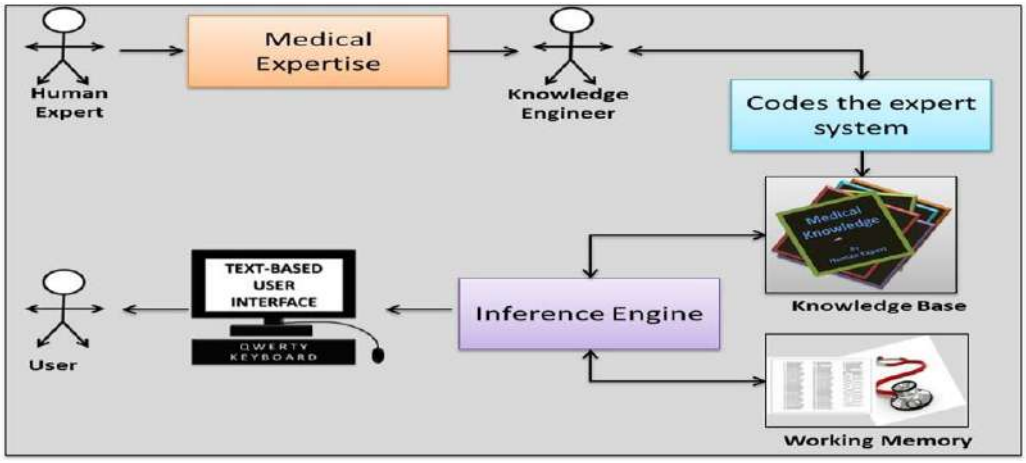

Figure4: Key components of expert systems.

1 Knowledge Base : The general information base for the field of study, drawn from the field expert (doctor). It consists of the medical information necessary for the functioning of the expert system and was taken from a specialist doctor in emergency medicine based on first aid treatment protocols. Medical knowledge is consists of a complaint, symptoms diseases and their treatment[5].

2 Inference Engine: Basic job of the Inference Engine is to do reasoning by connecting rules to facts and deducing new facts.

3 User Interface: The User Interface facilitates communication between the user and the expert system[6], the part responsible for receiving information and presenting the final result, which is a report that contains the necessary emergency measures.

4 Explanation: Used explanation to module enables the user to ask the expert system how a particular conclusion is reached and why a specific fact is needed.

5 Developer Interface is used developer interface to modify the knowledge[3].

Main Screen Of The Program

This interface is divided to two sections:

- The medical expert system
- The external program(code program)

Figure5: The main screen of the program.

Figure6: first section is the medical expert system and second section is the program code.

In figure7, the system consists of : Diagnosis(diagnosis the patient)

Figure7: The diagnosis the patient

And in figure8 consists of two part:

- Determine the patient status (consciousness, unconsciousness).
- Medical Report for patient.

Figure8: determine the patient status and medical report for patient.

In figure9: when the patient is unconscious

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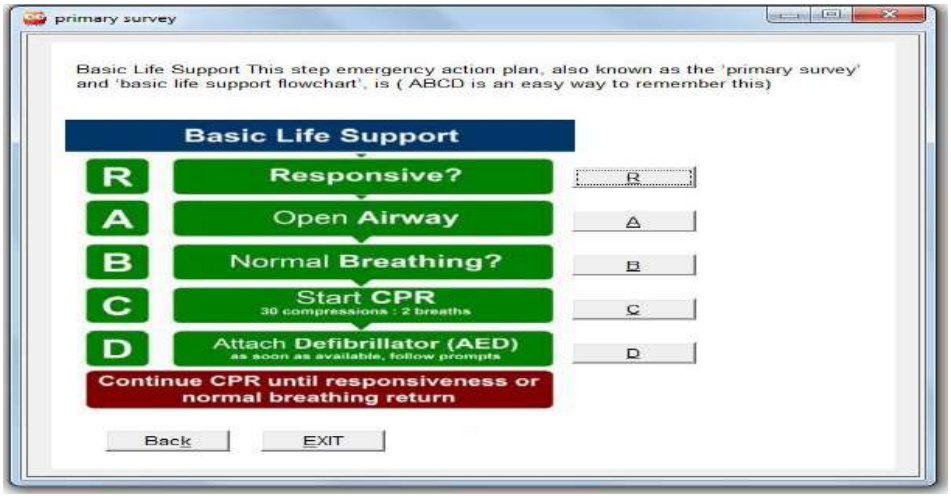

Figure9: primary survey

In Figure10: when the patient is conscious, take some patient information

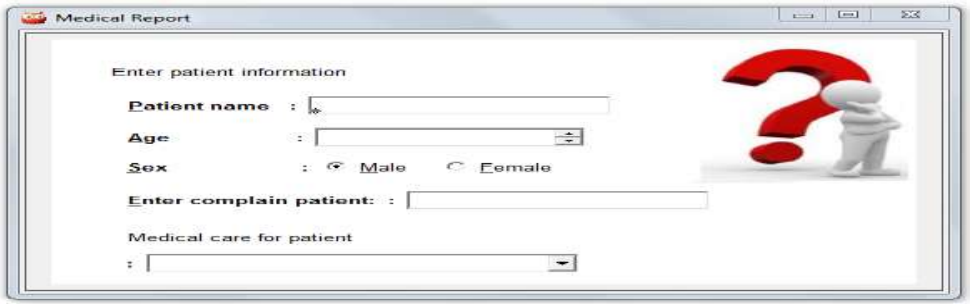

Figure10: patient information.

In Figure11: The secondary survey has four steps:

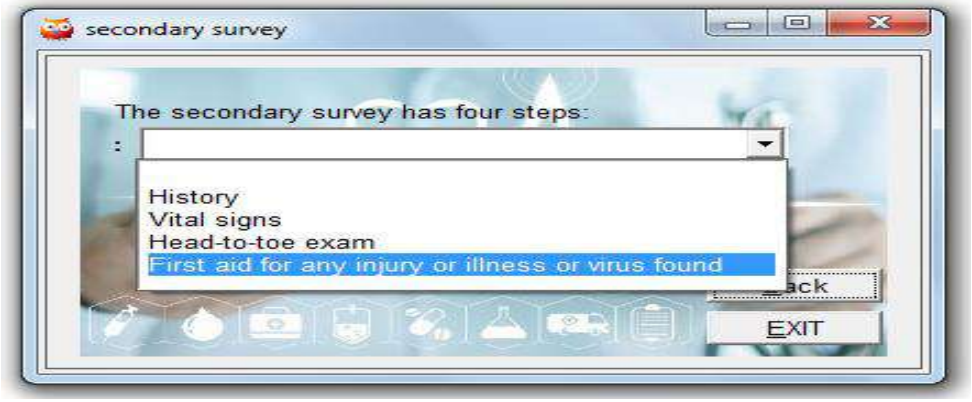

Figure11: secondary survey.

1 History:

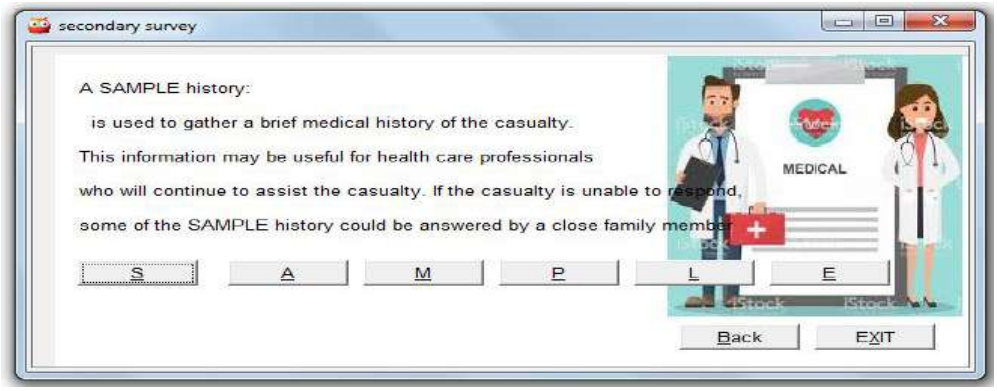

Figure12: SAMPLE history

2 The vital signs:

Figure13: The vital signs screen.

3 Head-to-toe exam:

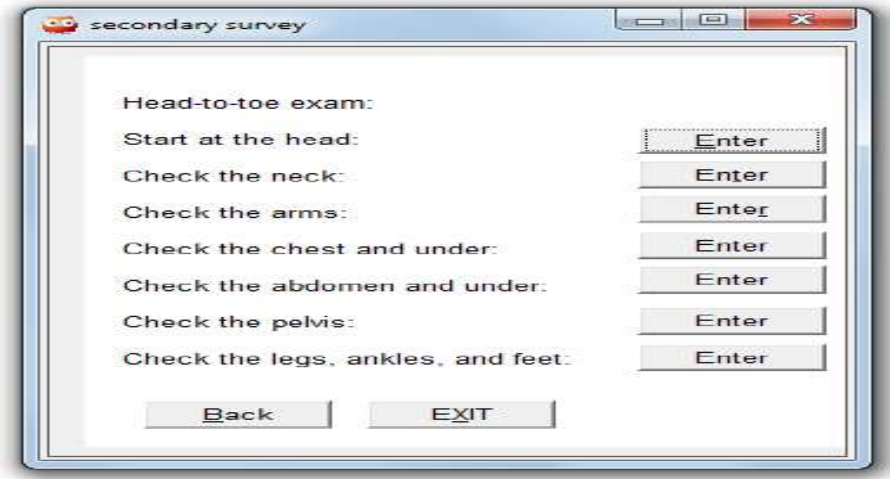

Figure14: Head-to-toe exam.

4 First aid for any injury or illness or virus found:

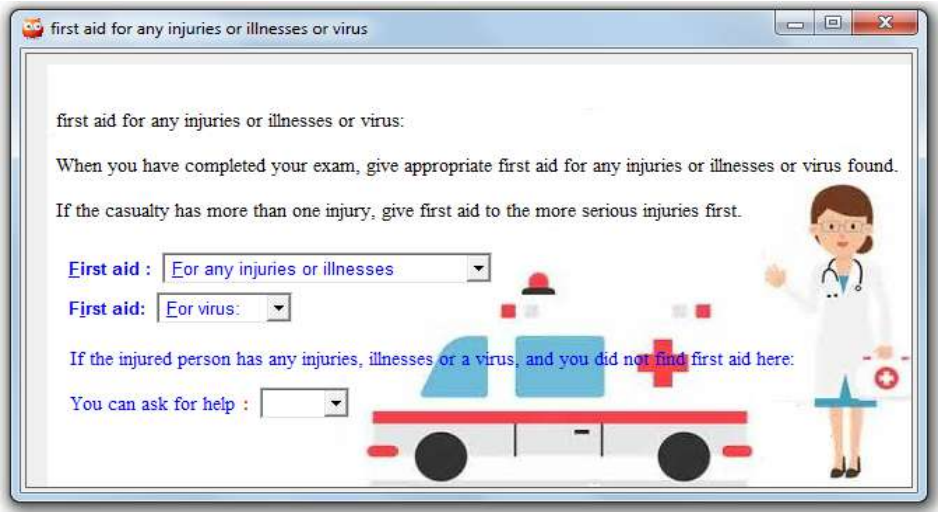

Figure15: First aid for any injuries or illnesses.

For example, first aid for diabetes:

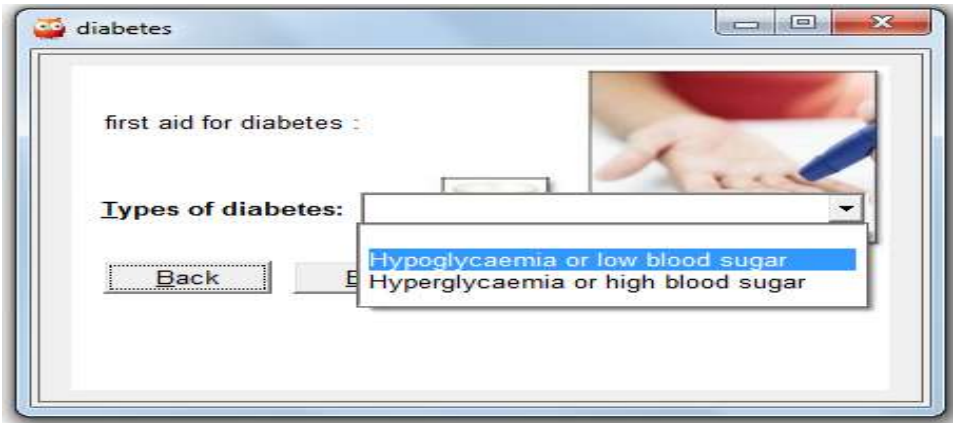

Figure16: first aid for diabetes.

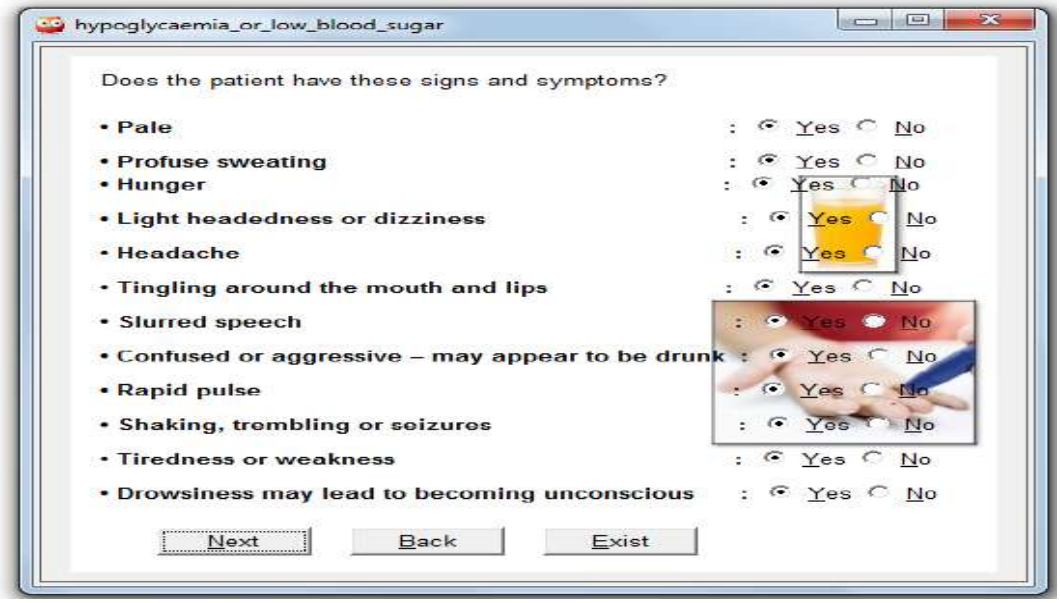

Figure17 (a): symptom diabetes.

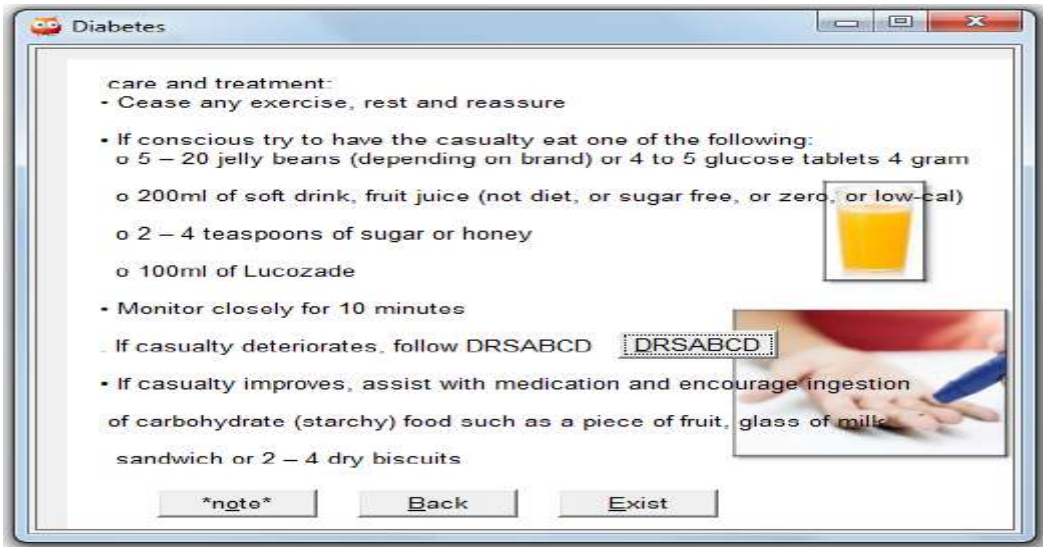

Figure17(b): care and treatment diabetes.

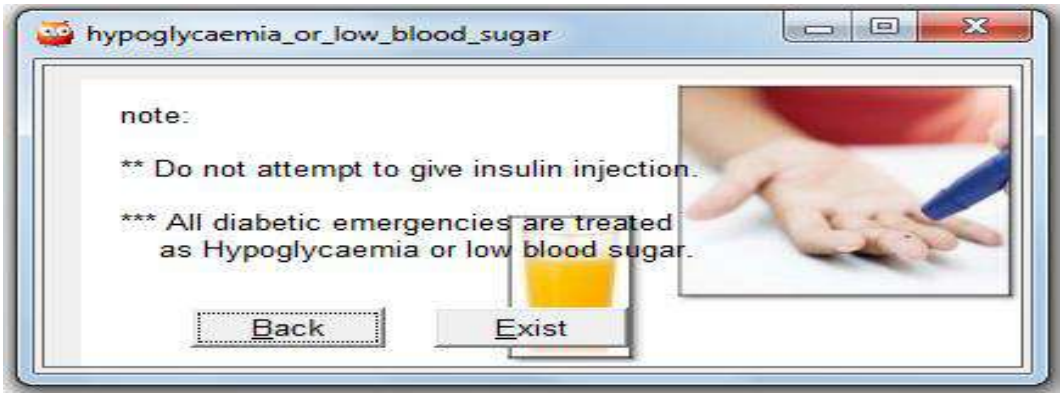

Figure17(c): note for diabetics.

First aid for virus:

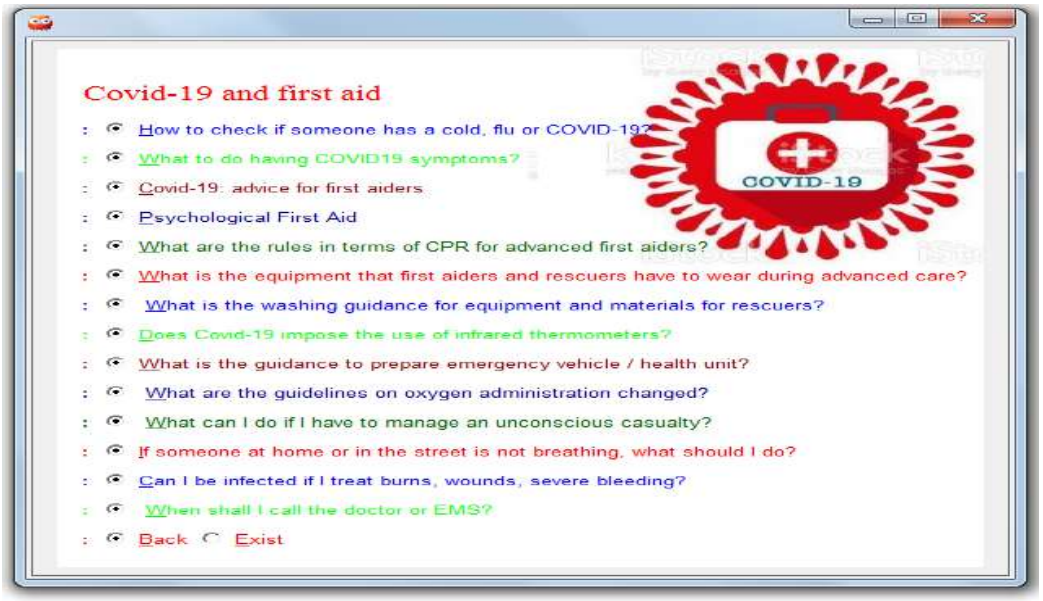

Figure18 (a): Questions about the covid-19 virus.

Figure18 (b): Check the symptoms of covid 19,flu or cold.

Figure18(c): Common symptoms between fever, covid and cold.

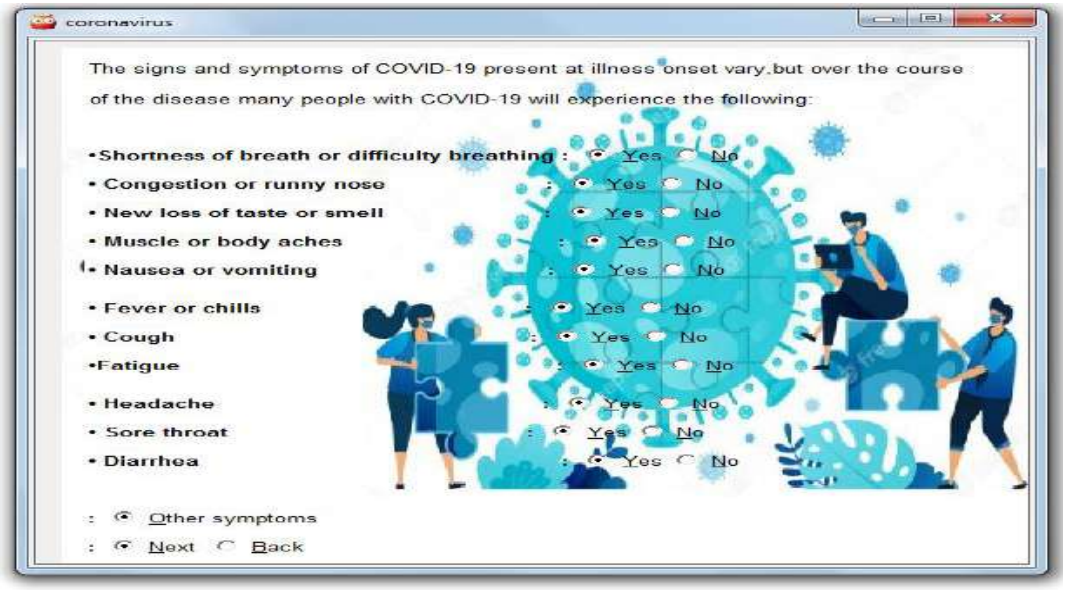

Figure18 (d): Symptoms and signs of covid.

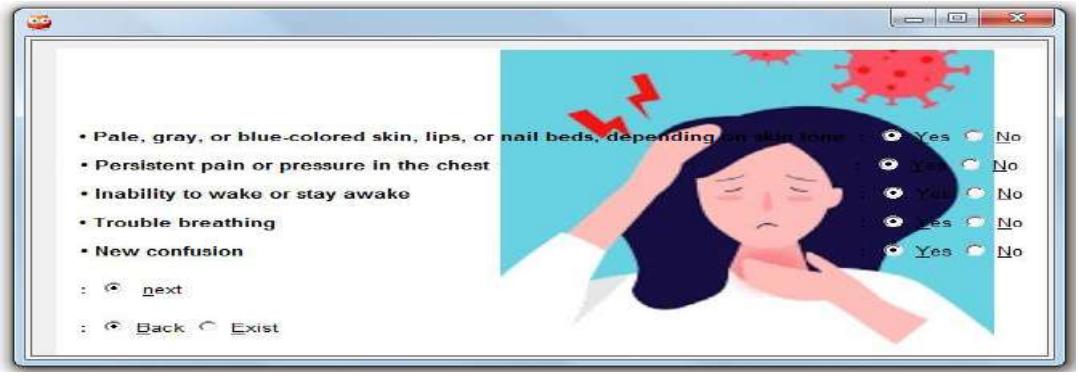

Figure18 (e): Other symptoms and signs of covid.

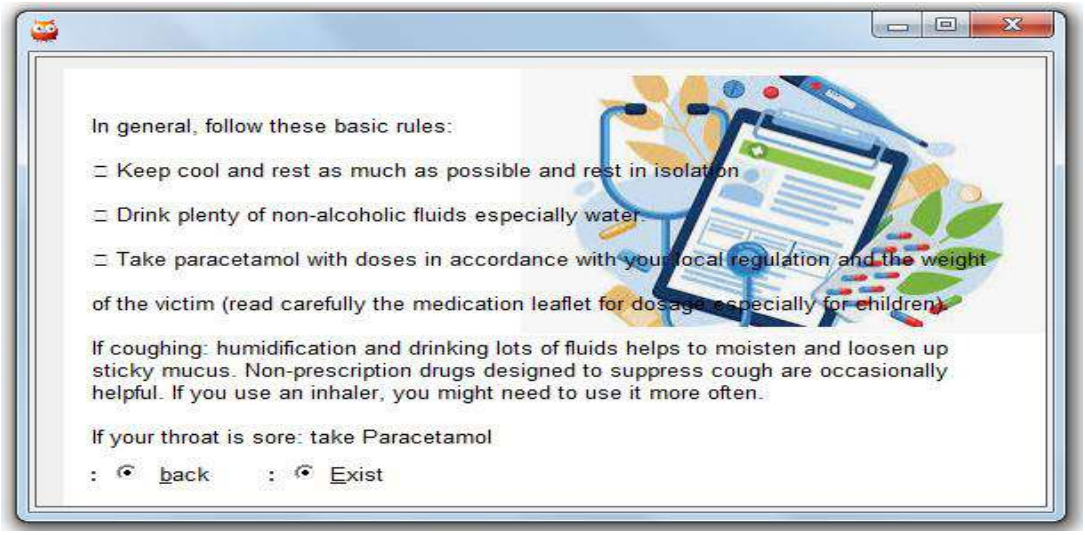

Figure18(f): Advice and emergency treatment for covid.

And the other part contains asking for help or writing advice for non-expert paramedics to benefit from it:

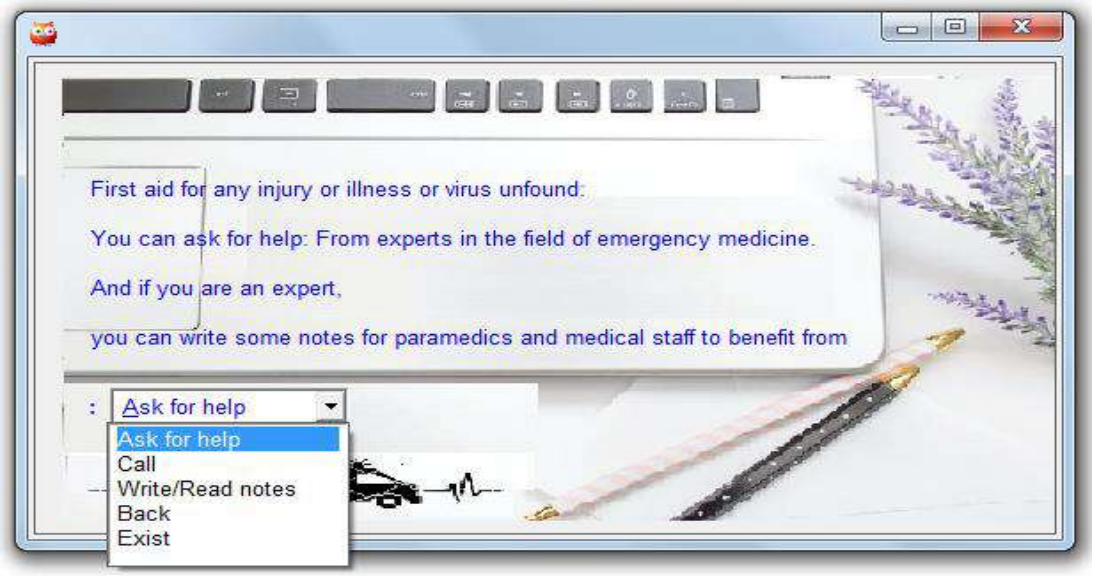

Figure19: Ask for help from experts.

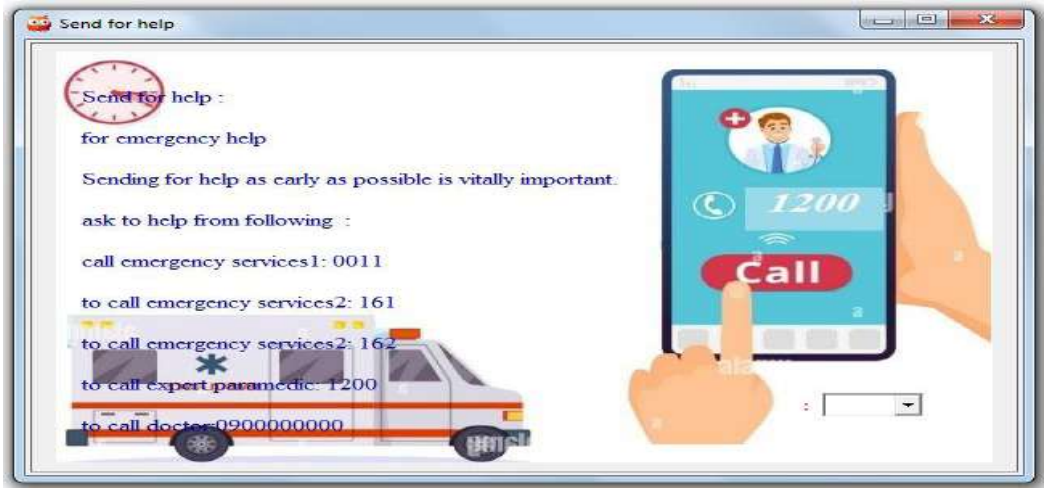

Figure20: Request help from experts by calling.

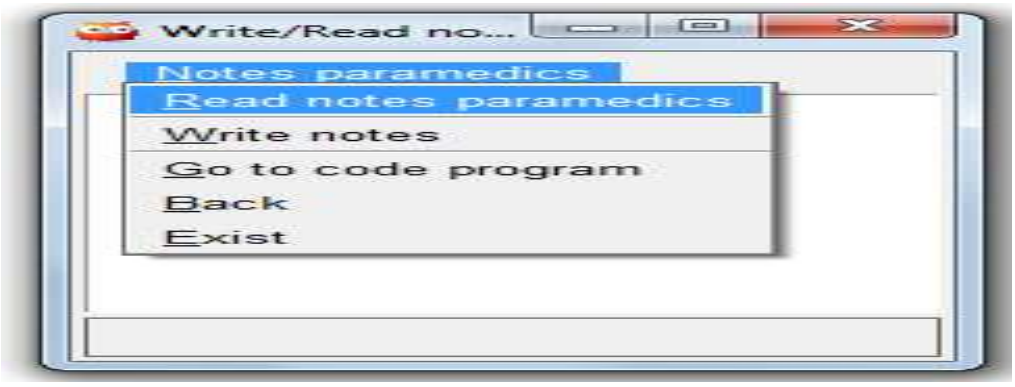

Figure21: Ask for help by reading expert advice.

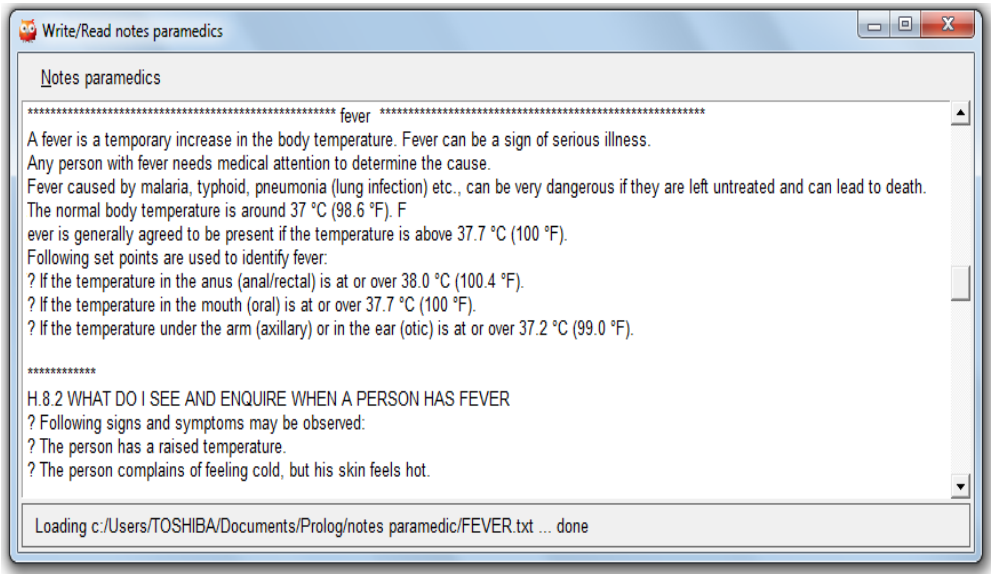

Figure22: Advice and guidance from expert doctors.

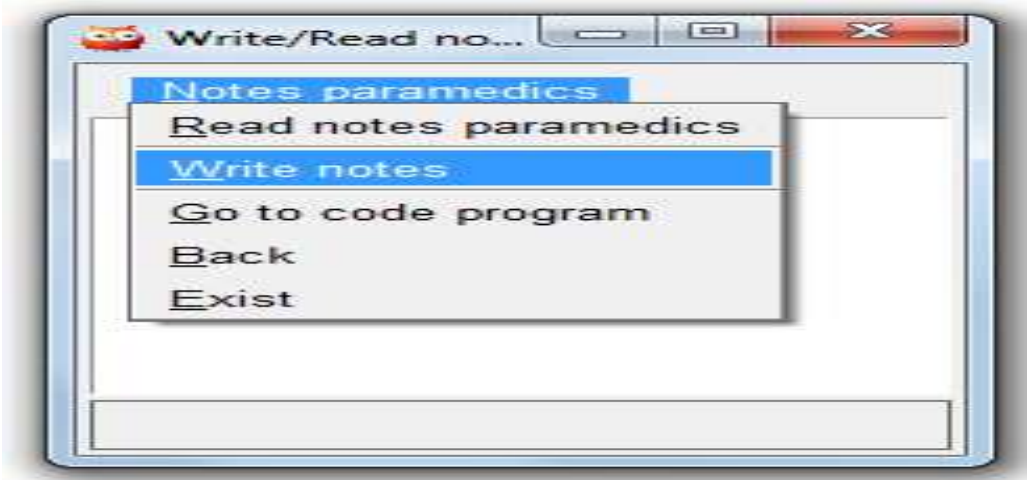

Figure23: To write medical advice or instructions from expert doctors.

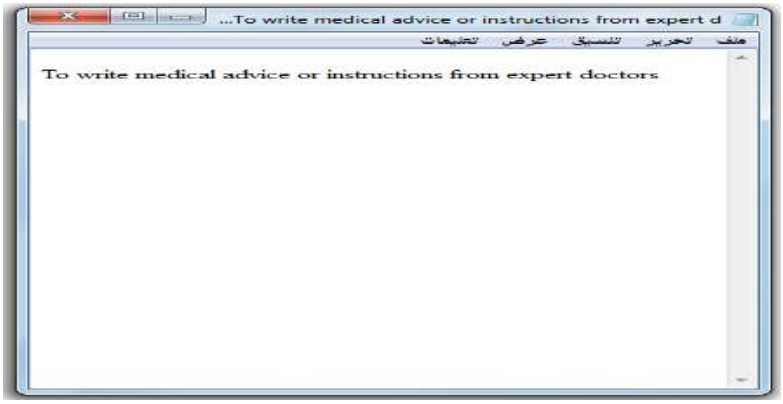

Figure24: write medical advice or instructions.

Medical Report for patient:

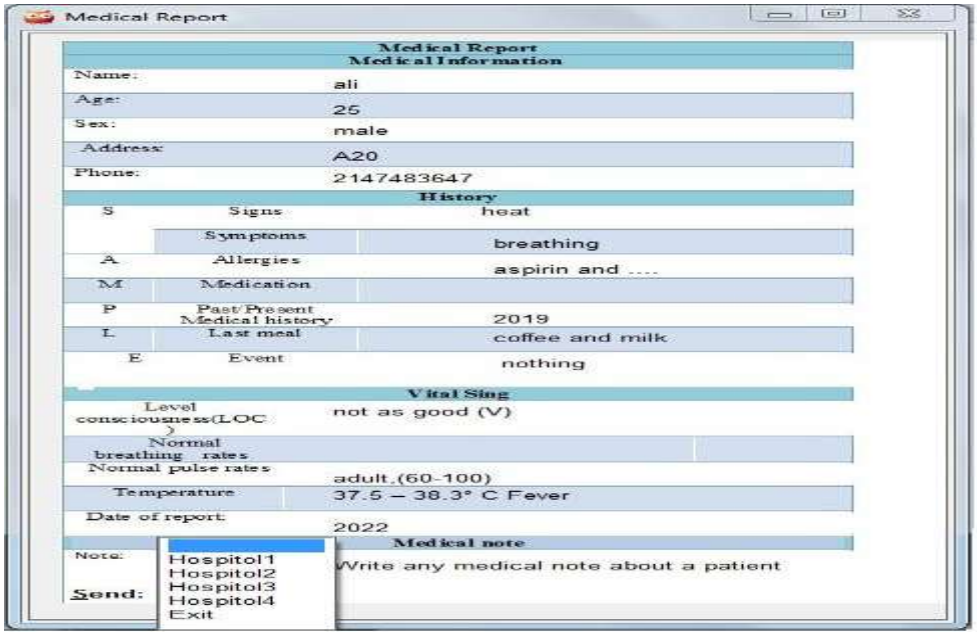

Figure25: medical report.

The patient's report is sent to a hospital near the scene of the accident

A message has been sent to confirm that the report has been delivered to the hospital emergency department.

Figure26: The message was received from the emergency department of the hospital

This section is only for programmers:

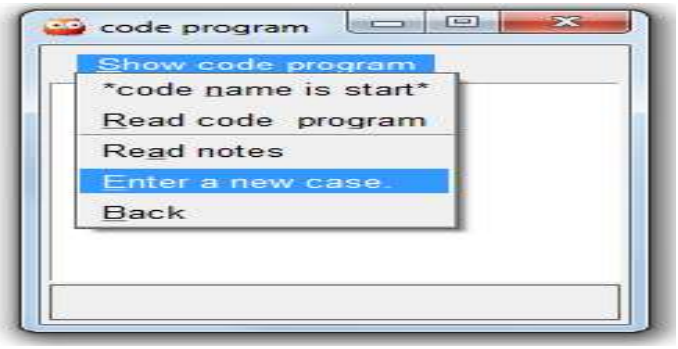

Figure27: Entering a new case.

Entering a new case: This is for programmers (licensed) only

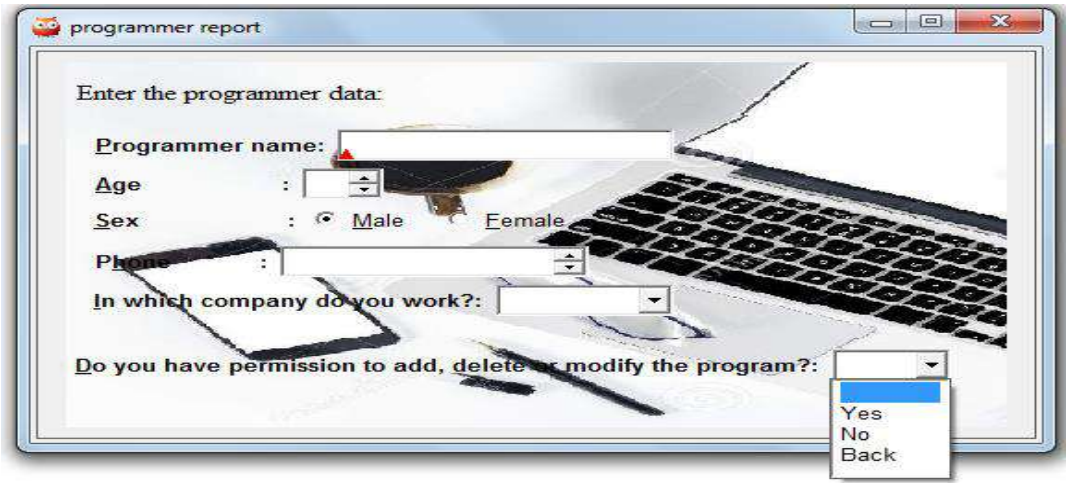

Figure28: Enter programmer data.

Do you have permission to add, delete or modify the program?

If the answer is no, read the program code

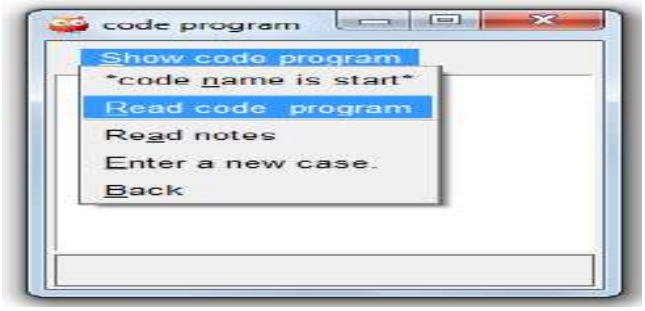

Figure29: read the program code

The programmer has a license to read the program code only and not to modify the code.

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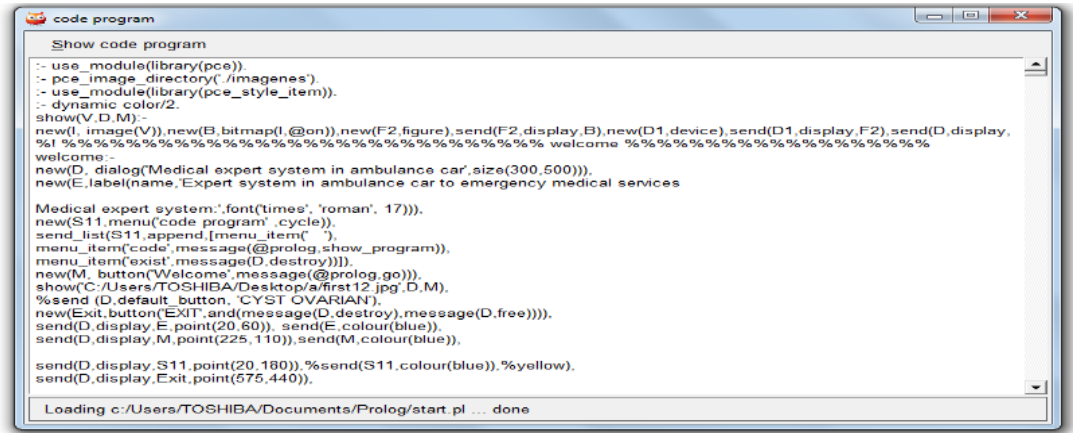

Figure30: read the program code.

If the answer is yes: enter the password for the program

Figure31: password for the program.

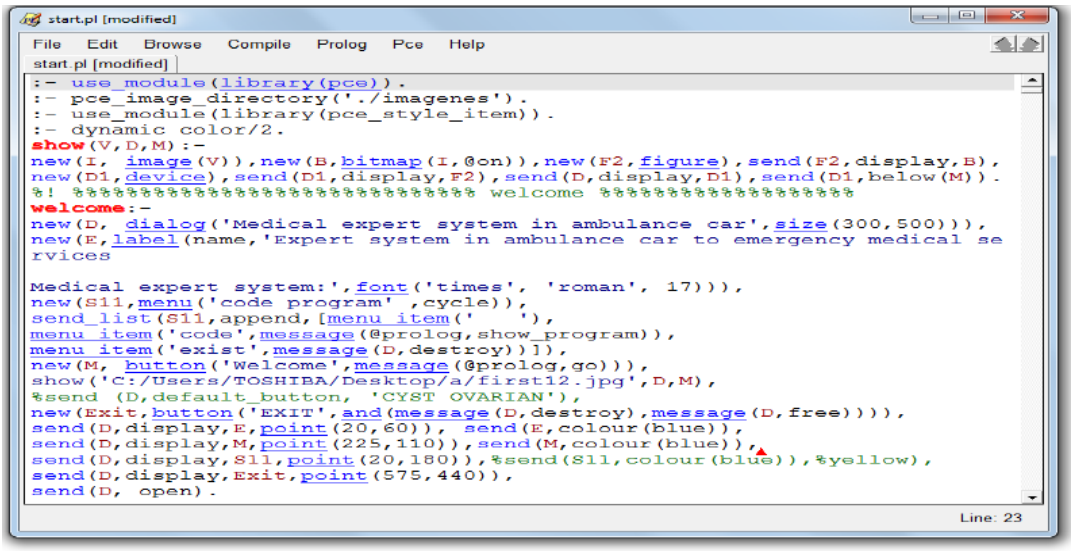

Figure32: to modify the program code.

The second part: From the expert system it is for learn first aid.

Figure33: expert system it is for learn first aid.

Conclusion and Future Work

The use of the proposed model will assist in diagnosing the pathological conditions to obtain a high score from accuracy to medical diagnosis. The implementation of expert systems will be of great importance and a catalyst for performance, especially in the field of health in rural areas where there are not many medical professionals. One of the most important research recommendations is to expand and develop the knowledge base to include all types of diseases existing around the world. In the future, we recommend that this system be developed as an application available on smartphones, so that the patient can use it in the absence of a doctor.

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