Online Patient Record in an Emergency Room Based on WEB 2.0 Technologies

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Abstract: - In the Health Services, computers are being introduced not only to provide direct care for the patients but also to obtain some important information regarding the type of: assurance, diagnosis (main or secondary) etc. Important information one can obtain from the patient record that must be field, when the patient is coming in the emergency room. This patient record can be stored on the computers with the application called OnLine_Patient_Record. Each user will introduce the information in an Excel file and this can be printed out and/or one can see also statistical result.

Key-Words: - PHP, Excel, Java Script, Database, summary statistic

1 Introduction
When the patient is coming in the emergency room the doctor or the nurse can introduce (store) in the PC all the fields that are in the patient record. This will be done with the application called OnLine_Patient_Record. The application uses at implementation level the server application PHP. The language PHP has a special flexibility which permits to be used with other technologies. These languages/technologies make possible to obtain remarkable results. The written application in PHP will be posted on a Web server and will be accessible to any user after authentication. Each user will introduce the information in an Excel file and this can be printed out and on can see also the statistical result.

2 Theoretical aspects
WEB 2.0 is a term describing the trend in the use of word wide Web technology and Web design that aims at enhancing creativity, information sharing and communication among users [2]. This technology uses the Internet / Intranet as a platform and includes some of the following techniques: Cascading Style Sheets, AJAX, Flex, HTML, JavaScript, PHP [6] and so many others.

The input data stored in the created database are processed by using elements of mathematical statistics. In order to investigate the character of a distribution, it is useful to have various measurements for describing the distribution, to draw pictures (histograms, polygons, etc.) of the distributions and to use certain measurements which are most commonly used to describe a distribution.

2.1 Technologies
2.1.1 JavaScript
JavaScript can function both as a procedural and an object oriented language. Objects are created programmatically in JavaScript, by attaching methods and properties to otherwise empty objects at run time. Once an object has been constructed, it can be used as a blueprint (or prototype) for creating similar objects. JavaScript language has a great advantage: it is a dynamic, interpreted, prototype-based language making it easy to use and flexible [3].

2.1.2. PHP
PHP (Personal Home Page and know PHP Hypertext Preprocessor) is a server-side scripting languages and uses clear, simple syntax; that makes it easy to read and understand, and encourages rapid web application development. PHP can be used on all major operating systems and has also support for most of the web servers. [2].
2.1.3. **HTML**

HTML (Hypertext Markup Language) is designed for delivering a document on the Web. It is the predominant markup language for the web and includes formatting control and syntax to include objects and any type of external element. HTML is compatible with all major operating systems and software [8].

2.1.4. **Database**

A database is a collection of data arranged for ease and speed of search and retrieval (American Heritage Dictionary of the English Language).

It is a difference in a database and a database management system (DBMS).

We can create a database using Excel List. A DBMS is a special program for storing and retrieving data, such as Microsoft Access, which requires more training than using a spreadsheet or word processor.

Excel can offer some of the following facilities:
- allow to pull in data from different worksheets because it has a great set of lookup functions;
- permit to display specific value in the column using the feature called AutoFilter;

2.2. **Measures describing the distribution**

The three most common values that measure the center of the distribution are the **mean**, the **median**, and the **mode** [1, 4, 5, 7].

These are three kinds of averages. Another type of measure which helps to clarify the shape of the distribution is the **dispersion** or the **standard deviation**.

2.2.1 **Measures of central value**

Central value refers to the location of the center of the distribution.

**Arithmetic mean**

The arithmetic mean (mean) is defined as the sum of all the observations divided by the number of observations.

**Median**

The median is calculated on the observations arranged in order of magnitude. This is defined as the point in the middle of the data range if the number of observations is an odd number and, if there is an even number of observations, it is the mean of the two central values of the range.

**Mode**

The mode of a set of numbers is that value that occurs with the greatest frequency. A distribution having only one mode is called unimodal.

**Note:**
For symmetrical curves we have

\[ \text{Mean} = \text{Median} = \text{Mode} \]  \hspace{1cm} (1)

- For unimodal frequency curves which are moderately skewed (asymmetrical), we have the empirical relation

\[ \text{Mean} - \text{Mode} = 3(\text{Mean} - \text{Median}) \]  \hspace{1cm} (2)

2.2.2. **Measures of dispersion**

The dispersion helps to clarify the shape of the distribution and is one that indicates how the observations are spread out from the average.

**Standard deviation**

The standard deviation is the root mean square of the deviations from the mean or, as it is sometimes called the root mean square deviation.

**Variance**

The variance of a set of data is defined as the square of the standard deviation.

2.2.3. **Confidence interval estimates for means**

Statistical inference is the inference about population from random sample drawn from it and includes also interval estimation. It is the use of sample data to calculate an interval of possible values of an unknown population parameter (e.g. mean). A statistical parameter is a parameter that indexes a family of probability distributions. One of the most prevalent forms of interval estimation is the confidence intervals. How likely the interval is to contain the parameter is determined by the **confidence level** or **confidence coefficient**.

**Confidence interval** is an interval estimate of a population parameter; it is often stated at 95% level. For a given proportion \( p \) (or confidence level), a confidence interval for a population parameter (e.g. mean) is calculated. In 95% of the samples (with size \( N \)) the interval below includes the mean of the population:

\[ (\text{sm} - 1.96 \text{std} / \sqrt{N} , \text{sm} + 1.96 \text{std} / \sqrt{N} ) \]  \hspace{1cm} (3)

and we can say

\[ \text{sm} - 1.96 \text{std} / \sqrt{N} < \text{pm} < \text{sm} + 1.96 \text{std} / \sqrt{N} \]  \hspace{1cm} (4)

where:

- \( \text{sm} = \text{sample\_mean} \)
- \( \text{std} = \text{standard\_deviation} \)
• pm = population mean
• N = size of sample

3. Problem Formulation

OnLine_Patient_Record is an online informatics system, dedicated to the patient care in an emergency room in a hospital and comprises several applications designed to reach the following aims:
- to get important information regarding the patient
- to get summary statistics and the chart type for the selected variables [4];

Using the software system OnLine_Patient_Record on can display or print the information stored in the current Excel file. For generating the summary statistic and the chart type on use the Web application e_Statistics [4].

4. Case study

The proposed software is a WEB application uses JavaScript as the programming language. The server side scripting language chosen is PHP. The database is an Excel list and it is generally available on any commercial web server.

While creating the software system OnLine_Patient_Record (Fig.2), we take into consideration the following characteristics:
- Modular construction, apt to be easily extended and also used in other hospitals;
- Unifying the used documents in the system so that it would offer flexibility for the users;
- Allowing data export and making easier the external processing and the print of the results;
- Dividing the application in windows based on the required functionality. Each window is loaded into the application interface independent of each other.

The menu bar (Fig. 2) contains the following applications:
- Fișa de observație clinică generală—allow, after authentication, the introducing of patient data in the Excel files (Fig.3);
- e_Statistics — allow to obtain statistics result for the selected variable (Fig.4) after authentication and also the visualization of the corresponding chart (Fig.5, Fig.6);

Following the fields enclosed in the Fișa de observație clinică generală (Hospital patient record) (Fig.1) we build the web application.

The model is realized in such way that the access to the application is granted for two categories of users: the administrator and the user.

The administrator is the person which has access to all parts of the application allowing him to manage the database information.

The user is an employee of the hospital - doctor or nurse - which has access to certain parts of the application, after authentication.
FOAIE DE OBSERVATIE CLINICA GENERALA

CNP  | Sex  
Name  | Prenume  
Date nasterii:  
Zna  | Luna  | Anul  
Domiciliul legal:  
Adres  | Loc  | Jkt  
Str  | Nr  | Mediu  | Urban  | Rural  
Residenții:  
Adres  | Loc  | Jkt  
Str  | Nr  | Mediu  | Urban  | Rural  
Genetica la nastere (sex masculin):  
ocupat  
Livră de război:  
C.I.I.C.  
Certificat de nastere (multiplicitate):  
Statut născut  
Angajat CNAS  
Angajat tranzit  
Nașterii:  
Data internații:  
ora  | minut  | secund  
Tipul internației:  
Criteriul internației:  
Diagnosticul de internare:  
Diagnosticul internare:  
Legături internații:  
Observatii:  

Fig. 3. The window with the information for a patient

Select column for chart generation:

Data
CNP
Sex
Name
Prenume
Zna
Luna
Anul
Naste
Loc
Jkt
Str
Nr
Mediu
Urban
Rural
Genetica
ocupat
C.I.I.C.
Certificat
născut
Angajat
CNAS
angajat
tranzit
Nașterii:
Data
internarea:
ora
minut
secund
Tipul
internare:
Criteriul
internare:
Diagnostic
internarea:
Legături
internare:
Observații:

Fig. 4. Selecting a variable for generating the summary statistic and the type of chart

4 Conclusion
This software application has been created as to be easily scalable and adaptable (on request) to other emergency room. The application uses PHP server-side scripting language, Excel list as database, all of these technologies are open source, and allow easy implementation on any server with any operating system. The application is very dynamic; it allows storing the information in the emergency room in real time.

The advantages of this application are the following:
1. The file created could be filled with other data in the aim to observe a specific evolution tendency;
2. Data bases created in Excel will be saved on server and only an authenticated user could see the statistic results;
3. The application is realised using free products.
References:


