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The Need of an Electronic Version of Child Health Record. Development of Child Health Record Web Application, Pilot Phase

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Abstract

Young children's health care is both an important and a complex need and it is related both to the surveillance of their physical and their psychological development. These data are mainly recorded in special booklets whose publication is under the supervision of the Ministry of Health. The Health Informatics Laboratory of the Faculty of Nursing of the National and Kapodistrian University of Athens, in an attempt to improve the process of obtaining data and the recording conditions of the aforementioned data, created the "Child Health Record Web Application" program. This is an electronic version of the Child Health Booklet (CHB), which is aimed at both parents and doctors, and which will contribute to the formation of health policies by the National Health System. The "Child Health Record" is an application that is accessed with a Web browser over the Internet. The program is at an early, trial stage, during which evaluations and views by a sample of possible future users are being assembled.

Keywords:

Medical Records Systems, computerized, child, internet

Introduction

The value and significance of preventive medicine is a generally accepted fact in the field of professional Health Care. Preventive medicine is advantageous in relation to therapeutic medicine since it has a greater influence on illness rates [1]. In paediatrics, more than any other medical specialty, preventive medicine has an especially significant place. Periodic preventive health surveillance takes up about 33% of the working time of the primary care paediatrician. This has the goal of preserving and improving child health [2].

In light of the obvious need for a program of systematic health inspection for children, the Ministry of Health has applied the institution of Child Health Booklet since 1976 [3]. In 1989 it established a program of child health inspection made up of pre-established clinical preventive examinations, whose results are noted in set individual health reports included in the CHB [4].

Many studies have concerned themselves with the evaluation of the CHB use in all these years [3], [5]-[9]. As a summary of these we can state that, despite the fact that the CHB has been introduced to everyday medical action, both parents and health professionals consciously or unconsciously ignore the greater part of its purpose with the result that the important value of the information it may carry with it, is lost. Far from the purpose it was designed to serve, the CHB is frequently just used as a vaccinations record card.

The reasons for CHB misuse go deeper than mere ignorance and should be sought out mainly in the areas of ergonomic value, availability and the principles of its design in general.

The need of an electronic version of the CHB

The CHB is a medical document, in which is recorded particular information concerning the child's health. In effect, it is part of the child's medical record. The well known and proved disadvantages of a manuscript health record, which are overcome by an electronic form, as well as the many advantages that the latter carries with it, are especially relevant in the case of children's health records.

The fact that children need to be treated differently from adults by medical professionals is one that cannot be ignored. Correspondingly, a child's health record partly differs from an adult's health record. There are special characteristics indispensable to an electronic system that seeks to support children's medical treatment. The fulfilment of these prerequisites – in addition to the basic fundamentals that apply in the case of adults – will result in the realization of all the advantages of an E-version of the CHB. There are differences in the following areas between a child's and an adult's health record:

1. Type of data (development information, newborn's name, special paediatric glossary, range of normal rates per age, time of birth).
2. Data processing (vaccinations, special requirements for instructions to the parents, standard reports).
3. System design (special issues of confidentiality, paediatric work conditions, family links, connections with the national district offices) [10].

Materials and methods

Description of the construction

The web page contains basic information regarding the CHB. It aims to draw the interest of health professionals, students in Health faculties and parents. It exists in a Greek and an English language version.

The electronic address of the web page is as follows: http://www.childhealthrecord.com. The apposite screen analysis is 1280X1024 pixels (Figure 1).

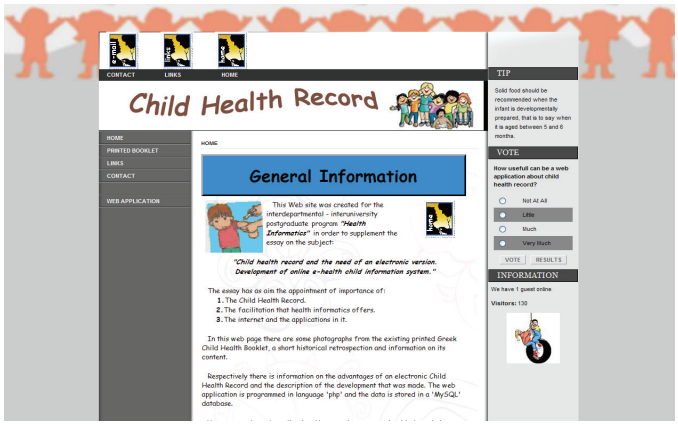

Figure 1- The first web page of the English version of the site

The creation of the application was done in PHP programming language, which has a high compatibility with the MySQL database. This language was used because it is considered as having the most advantages among programming languages such as ASP, Java [11]. JavaScript code was also used.

The application's graphics are HTML pages, frequently combined with CSS. The tables of the database – planned previous to programming – were created representing the subject of the data.

The application's window is of sized 780X600 pixels. The window does not demonstrate the menu and toolbars that normally go with the web browser.

Actors

The application users are divided in three roles. The user might be a parent, who will only be able to browse information, a doctor, who may browse and edit information and the administrator, who will be able to add or delete children in addition to the above uses.

Entrance to the application is enabled through inputting the username and password that the user is required to type on the application's first page.

Contents

All screens were designed in such a way as to be pleasant to look at and easily read in the analyses used by today's majority of monitors. The site has created a friendly 'environment', since it is not only aimed at health professionals in search of an ergonomic site, but also to parents, who are to make up the majority of the site's users.

In almost all of the sites 'screens' there is a right-hand button named 'information', which directs the user to information or groups of information that are mainly directed to parents, explaining the contents and answering questions. The 'information' pages are connected to the initial report pages so that each time the information connected to the relevant data of the application appears.

The thematic units developed are those that exist in the printed version of the CHB, updated and completed. Each unit appears in the form of a 'tag' and navigation is enabled through a bar at its lower part (Figure 2).

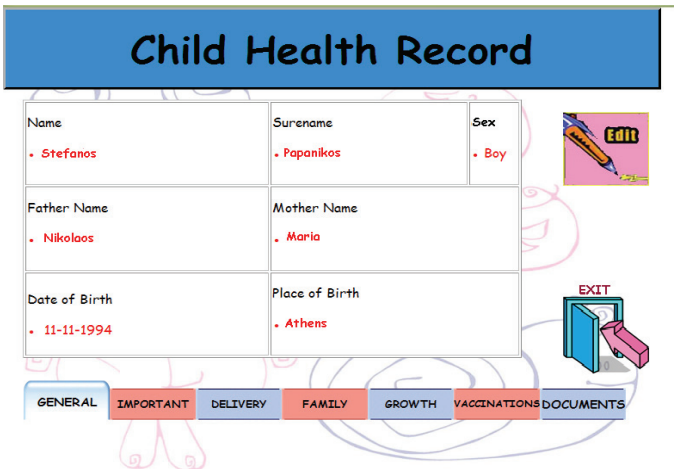

Figure 2 -"General" tag of the web application

Initially, there is the general information – demographic data concerning the child (Name, Date of Birth etc).

A separate 'card' is devoted to important information of which the doctor should be aware, such as allergies, enzyme deficiencies, serious illnesses and conditions.

Next, follow information concerning pregnancy and delivery (time, problems).

The parents' personal data and any chronic health problems are mentioned in detail.

The development card contains a powerful tool which enables the appearance of the child's somatometric data on the growth chart which presents the normal rates (Figure 3). In this card there is also contained information on the first infant examinations, psychokinetic development sup-

ported by images showing the attained abilities and dental problems.

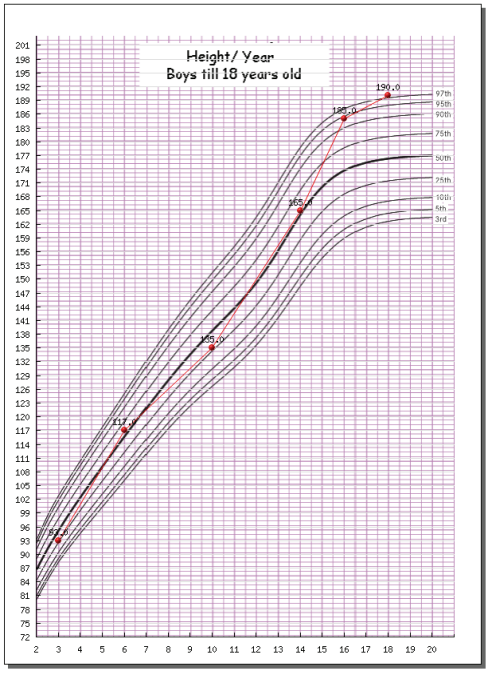

Figure 3 - Height growth chart for a boy (3 to 18 years old)

The vaccinations card, which demonstrates, in concentrated form, the diagram of compulsory vaccinations in Greece could not have been omitted from this card. There is also space for other vaccinations and for recording the date and type of the next planned vaccination (Figure 4).

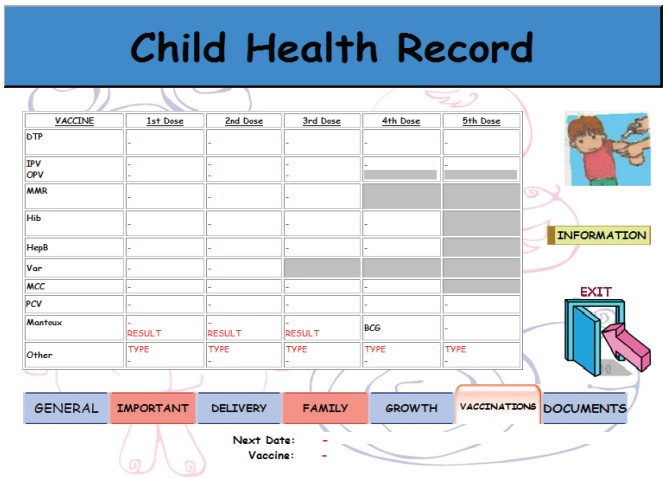

Figure 4 - Vaccinations card

The final card demonstrates three documents that need to be completed for the child's registration at school or the district office and during intervallic check-ups. They can be completed and printed electronically.

The doctor may alter the information by pressing the 'EDIT' button, which only appears if the password given belongs to a doctor. The rates for the relevant fields at the given time appear and the doctor is not obliged to re-enter all the data if s/he only wishes to change one. During the filing process, the process of selection is made easier as the doctor is requested to choose out of prepared answers that exhaust all possibilities (for example, sex: BOY/ GIRL). The input of all dates is done through an electronic calendar. During the input of a vaccination the doctor is requested to choose the vaccine and the dose. If the combination is wrong, the system will indicate the fact.

The date of birth is processed so that the child's age may be found and certain functions calculated automatically, such as the automatic choice of the correct category for filing the development data (A, B newborn examination, 0-36 months or 3-18 years).

The doctor – and the parent – is enabled, by pressing the 'information' button, to see the time-plan of the child's vaccinations and the period in which the child will be at the time will be highlighted in yellow, through an automatic calculation based on the date of birth.

In the same way, sex defines which development diagrams will be chosen and presented to the user. If sex has not been filed, the user will be requested to indicate sex.

Finally, the administrator will be able to view, analyze and make copies of all tables included in the database. The most important of these are the tables showing who entered the site and when, the changes s/he made and when s/he left the site. Apart from this, however, there are two buttons for the simplification of routine tasks, such as the addition of a new child or the deletion or edition of the data of another. During the addition of a new child to the database, two passwords are agreed upon, one for the parents and one for the doctor. The same combination of username as that of another child is forbidden, as also the identical passwords. In deletion-edition, there is a search filter for the child, who can then be deleted or its data edited.

Evaluation

A questionnaire containing 15 evaluation questions was created and 100 students from the faculty of nursing were asked to use the application and answer the questions as future health providers, parents and health system managers. The questions requested of the students to evaluate the application regarding completeness of the contents, availability, speed, safety, ergonomic value, possible contribution to health, general impressions and to add a comment. Each question had a scale of 5 answers with 1 as the lowest level and 5 as the highest level of achievement.

Pre-evaluation by possible users may have much to offer as far as improvement and completion of the application are concerned, prior to the distribution of the application to real users.

Results

The outcome is well presented in Table 1.

Table 1 – Answer averages (approximated)

Question	Answer as health provider	Answer as parent	Answer as manager
Availability	5	5	5
Usability	3	4	4
Data Presenta-	4	5	4
Browsing	3	4	4
General Content	4	5	4
Medical Con-	4	5	5
Vaccination	5	5	5
Information	4	5	4
Other content	5	5	5
Retrieve Speed	3	3	4
Store Speed	3	-	4
Security	3	2	4
Electronic	5	4	5
Contribution to	4	5	5
General Impres-	4	5	5

Discussion

The choice of the critical sector of the paediatric health record brought us face to face with three groups of people using it: the parents, the health professionals and the health system managers. The results of the pre-evaluation can be easily explained by analyzing the views, expectations and reservations of each group separately.

The parents' views

The children's parents are well aware of the fact that health care is made up of many and complex information drawn from various sources and they have certain worries regarding the way in which the data concerning the health of their children are filed. Parents are well aware of the need for regular health checks, evaluation, vaccination and preventive services for their children and there is a general acceptance among them of electronic systems for the coordination of health care.

However, families with multiple sources of health care are quick in realizing that access to and movement of information may become problematic, with delays and difficulties in ER, specialized surgeries, public hospitals etc. Parents also report that frequently they themselves have to act as mediators between the suppliers for test results, clinical instructions, pharmaceutical prescriptions and in general for all information concerning the past, in a struggle to keep at bay the possibility of unsuitable treatments due to lost information.

Many parents worry that easy access to their children's health records is not available and they often report reactions to wrong medicines as examples of things that could be avoided through an electronic system. Parents are also aware of the importance of timely vaccinations, as they are conscious of the fact that the challenge lies in changing the progressively more complex programs of archive conservation required for the introduction of medical care in schools.

A small, but often effusive percentage of parents appear to be suspicious of large, centralized data systems in private, and even more so in public hands. So parents want to actively hold and manage their child's medical record themselves, and request access to recordings as well as the right to insert their own comments. Some parents are further concerned with the fact that data are given to employers, parents that have not been granted child custody etc, and they request the deletion of certain information.

All parents hold the view that there should be a way in which they may be informed in simple words on the various matters connected to childcare. They are asking for an information system, which will supply them with expert information and advice on such topics as breastfeeding, nutrition, correct child development etc [12].

The health professionals' views

Electronic health records exist so as to transport data to and from the suppliers of health services. Doctors, understandably give more thought to the information that they should receive than to the information they are requested to disclose. They recognize, nevertheless, the needs and expenses of both centralized and decentralized channels. They would rather have access to an efficient, friendly, flexible, reliable incremental source of all they should know, as well as an incremental, economical 'device' for passing on data.

They believe that such a health information system would be able to give them fuller and more reliable information regarding vaccinations, medication and certain examinations and for extra-medical services that their patients receive. The system should also enable them to send this information to colleagues, schools etc. They require from

the system to automatically produce notifications, parent reminders, diagrams showing the gaps in immunization, notifications regarding critical laboratory rates or allergies to medicine and other important data. The doctors always have the most important share in the quality of care, but they know that these systems can improve this quality even further in everyday practice.

An information system like the one described above facilitates the securing of quality in medical practice. This, however, can turn against professionals as much as it acts favourably towards them. The profiles of clinical efficiency for the medical practice in a number of areas – such as the immunization percentages and screening tests – become higher and more sensitive, both for professionals and outside observers, such as insurance companies and health authorities. Doctors are sometimes worried that this data will be used to evaluate their work but without any consideration of the complex needs of the children under surveillance or of the working environment. In addition, the economic data are usually made accessible to insurance companies as well and these latter may discourage any new investments.

The doctors and the rest of the medical staff are also quite suspicious of large systems of electronic data, after years of disillusionment with older systems. They either had had to turn vanguard staff to people responsible for the difficult and painful task of recording data in an electronic form, or they never used the system. All this constitutes doctors suspicious towards new, demanding electronic systems in their offices.

Health Systems

Public health is part of both the distribution of information and the application of the population based policies and operations. As dispensers of paediatric services, public health programs share many of the hopes and qualms related to electronic versions of CHB. The public health sector is responsible for comprehensive preventive services as well as for the surveillance of patients, the regulation of health care and the state collection and analysis of health data. Each of the above has specific needs for information, which would be better collected if the electronic CHB had been in use.

The first objective of an electronic health data system is the reinforcement of the preventive health services for children, usually in the form of vaccination archives. The advantages of an electronic form include the system for newborns' screening tests, the evaluation of diet and the other services and these make the electronic version a much richer source of data for community practices, management and leadership of public health.

The allocation of licenses to suppliers of health services to children, such as paediatric clinics and private surgeries, is not subject to any form of control or monitoring. An overview of clinical data for each supplier would allow a health control panel to focus more on the quality and the outcome based value of health care provided, rather than spending itself on inspection raids.

Apart from the roles mentioned above, the health system also runs population based operations, in cooperation with community and private health care, such as the goal setting health promotion and the regular control of disease, which allow access to health care, health awareness at the workplace and the differences in the health level of minorities. Each one of these projects has a strong stem in childhood illnesses and could use the population's clinical data in order to improve the planning and evaluation of a program [13].

Conclusion

The transition to an electronic version of CHB can contribute significantly in the promotion of children's health and of society's health in general and can become a powerful tool for parents, professionals and state health planning.

In Greece, as in many other countries, the traditional, manuscript health records are still preserved. We believe that through the present study we can contribute to the acceleration of the changes towards an e-health system for children.

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