

Development of EMR Based HIMS with the Support of Icon Based Text Editor

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Abstract

Hospital Information Management system includes registration of patients, storing their details into the system, and also computerized billing in the pharmacy, and labs. The Hospital Management Information System helps health administrators to exercise an enhanced monitoring control over the functioning of hospitals by using decision support indicators, to assist doctors and medical staff to improve health services with readily reference patient records and a workflow enabled less-paper process and to provide efficient and timely treatment to patients through automatic alerts during patient treatment cycle. In the traditional HIMS the Intensive Care Unit (ICU) area is omitted in the system or the implementers face serious problem with ICU section because this area always handles serious data, so it is very important to store and handle systematically. Otherwise it loses a valuable life. An ICU automation system can alleviate the severity of above problem to a large extent, since it can ubiquitously capture all important information from the ICU and store it in the EMR.

1. Introduction

A medical record is a confidential record that is kept for each patient by a healthcare professional or organization. It contains the patient's personal details (such as name, address, date of birth), a summary of the patient's medical history, and documentation of each event, including symptoms, diagnosis, treatment, and outcome. Relevant documents and correspondence are also included. Traditionally, each healthcare provider involved in a patient's care has kept an independent record, usually paper-based. The main purpose of the medical record is to provide a summary of a

person's contact with a healthcare provider and the treatment provided in order to ensure appropriate healthcare. Information from medical records also provides the essential data for monitoring patient care, conducting clinical audits, and assessing patterns of care and service delivery.

2. Patient Medical Record

The Patient Medical Record (PMR) updating process in ICU is completely manual. To understand the flaws in ICU we conducted a 48 hours of continuous observation at a hospital. From this we came know that duty nurse is expected to undertake this manual filling or record whenever she has free time. However, many at times of tight work schedule they tend to postpone this. This affects the timeliness of the information. Another issue is that, since all entries are made manually in the paper, continuous usage leads to missing of some of the pages. This affects the completeness of the information.

Another major issue relates to lack of synchronization with the laboratory. Due to this the duty nurse is forced to go there and exchange information in person. During the time of noting of prescription there are chances for errors. Since this will not be reflected in the PMR, the information contained there be comes incorrect. In fact all manual entries are source of potential errors, especially when there is no way to determine the time history of such entries. The medical records are clubbed under medical record wing, within a large storage space.

The PMR is thoroughly checked and sorted prior to storage. The incomplete files are returned back to the corresponding department for correction. If a request for previous PMR arrives to the MR department, its retrieval normally takes a few hours. So to avoid all these flaws, after a thorough analysis of the neuro ICU system we come out with different modules where there is the need of automation[1].The drawback of the existing system

is that it is very difficult to retrieve data from case files. It is difficult to handle the whole system manually and it is less accurate and to keep the data in case files for future reference because it may get destroyed. Moreover it is very difficult to retrieve data. Redundancy of data may occur and this may lead to the inconsistency. The manual system is so time-consuming. Proposed system must support existing application and it must be easier and user friendly than the traditional method.

3. Electronic Medical Record

Electronic Medical Record (EMR) uses the alternative method of storage of all health care data in electronic format. The advent of EMR has not only changed the format of medical records but also increased accessibility of information contained in the repository [3]. It is widely believed that broad adoption of electronic medical record (EMR) systems will lead to major health care savings, reduce medical errors, and improve health.

Significant implementation issues and challenges continue to face the widespread adoption of EMR systems. The main challenges:

- Cost
- Security and privacy issues
- Acceptance and training
- Infrastructure development and technical issues

4. Tablet Based EMR System

Most of the conventional Hospital Information Management Systems (HIMS) make use of stationary Desktop PCs for work flow automation. This has lot of limitations with regard to the clinical data entry, patient monitoring and generation of Electronic Medical Records. The use of Desktop PCs results in lot of difficulties which possibly can be avoided if Tablet PCs are deployed. These Tablet PCs are centrally connected to a server in a Wi-Fi enabled hospital space. Major advantages of the proposed system are:

- _ Portability
- _ Small size and less weight
- _ Can be laid at on the working surface
- _ Great and handy for note taking

This system offers a set of advantages for the clinical staff, since they can move around and perform various tasks and at the same time use the

device at their point of service. It will reduce the effort involved in clinical data entry, thereby allowing them to provide better patient care. The system will automatically provide more accuracy, swiftness and flexibility to their work flow.

4.1 Bedside Computerization of the ICU

Implementation of tablet based EMR introduce a novel idea of bed side computerization in ICU. Main goal of this idea is, it would create a computerized medical record, reduce the clerical burden on the staff and provide the necessary data for patient care and research in a unique and meaningful fashion. Through this the time spent on documentation can be reduced and Patient care will be improved. Computerization can provide legible records, data accessibility from multiple locations, customized and sophisticated data displays, and data interpretation and decision support tools. Yet the success of a system depends on its ability to provide these benefits with a minimal interaction from the users. The most difficult task in creating a computerized medical record is capturing data that cannot be obtained electronically. Human data entry is necessary to complete the on-line record, and the implications of this must be understood.

The computerized medical record that replaces the paper chart will be one that requires a minimal amount of data entry and provides functionality not available in the paper format. Paper and pen are both easy to use and flexible. Despite the many disadvantages of a paper record (illegible data, a single location of data, and inability to track data over time), it continues to be the preferred method of charting.

5. Icon based editor for EMR

Unlike the traditional paper-pen input method digital tablet based system provides a number of data inputting mechanism, among them some methods are easy to use and some may cause additional burden in the staff. In the icon based text editor there will be a graphical editor that can be easily configured by either the individual user, or the hospital administration, so that the noting can be entered into a text screen with a few key-strokes. The system will provide a set of icons and by pressing them a text message will be formed. This may be edited prior to storage. The icons to text string association is made in such a fashion that there is an icon available for most often used text strings. A number of user defined icons will be available for set-up and the individual users can associate text with these [2]. The icon based text

editor is designed to solve the above problems of PMR. It consists of a set-up phase and an edit phase. The set up phase attaches the required phrases with a set of icons. This is done only once. The edit phase has two passes. In the first pass, the user is presented with an icon keyboard and a display screen. The user creates the draft message by pressing the appropriate icons. Since the icon set is tightly attached to the application domain, a few keystrokes is all that is needed to create the draft. Once this is complete, an automated fair up routine will convert the draft into grammatically correct sentences of the underlying language (English and Malayalam will be considered in our implementation). The resulting text will be presented to the user along with the standard virtual keyboard for the language. This enables final corrections.

Fig.1 gives overall scheme of icon based editor (iEd). The text given in red color stands for packages operating on the corresponding data and producing the indicated output. Table I below gives the list of packages and their functions. The packages requiring interaction with users is indicated with a corresponding icon. The most important among them is iEd Draft that generates the draft of the final text document.

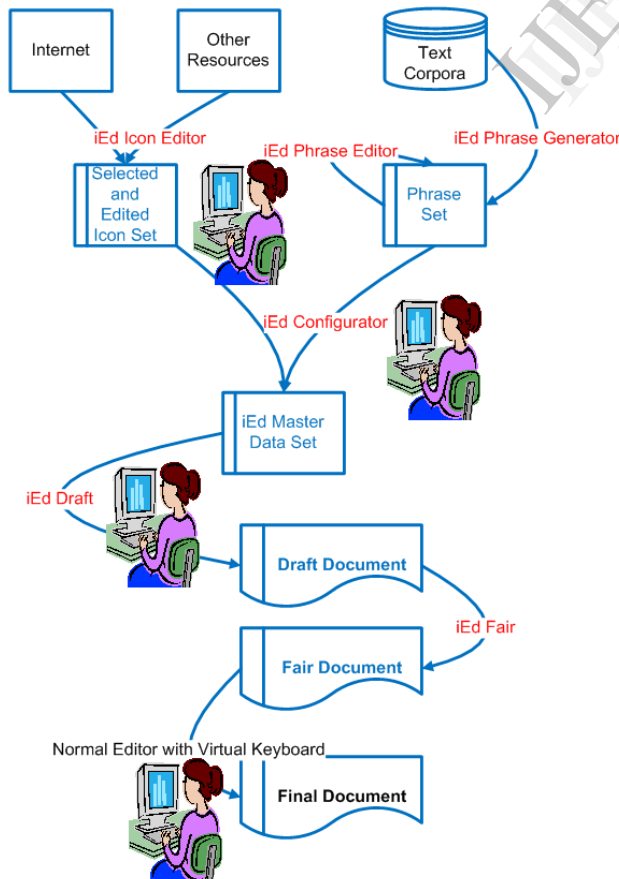


Fig.1: overall scheme of icon based editor (iEd).

SNo.	Package	Function
1	iEd Phrase Generator	Uses an input file with a large set of sample text, similar to the one to be generated by the current configuration of iEd. In the case of nurse's record, this could be the raw text entered by nurses for the last three months. The input text should be as large as possible. The program will use a heuristic to generate a set of phrases and create a histogram of their usage within the text. This will give the user an understanding of the phrases to be used for iEd. In case the histogram is more or less flat, the application is not suitable for icon based editing.
2	iEd Icon Editor	This is an application similar to "Paint". The user is provided with a repository of existing icons. He can modify them, give them a fresh name and save to the icon repository.
3	iEd Phrase editor	This program works on the phrase repository created by iEd phrase generator. It provides the opportunity to edit these.
4	iEd Configurator	This package works on Icon and Phrase repositories and associates a set of

		icons with a corresponding set of phrases. This effectively creates an icon keyboard. Many such keyboards can be created. The user can freely switch between these keyboards.
5	iEd Draft	This is the draft editor. It has a icon keyboard section and a text display section. When the user presses the icon, corresponding text is placed on text window.
6	iEd Fair	This is a language processing tool. The input is the text in text widow created by iEd Draft. The output is a grammatically correct (or at least better) text automatically created by it. This is passed onto a normal text editor to create final document.

Fig 2 gives the rough approximation of the input screen of iEd. It has a scrollable text area giving the generated text. Below this we have the icon keyboard, arranged as a 5x7 or 7x5 matrix depending on screen orientation. The separating line between these displays the text associated with selected icon. The icon set is selected from a list box on the left side. The user can select any set from this. The key set for scrolling, deleting, and backspacing is provided as a separate section. These operate over phrases rather than characters. Numeral keypad is provided along with it. A modifier icon is provided to specify onset of a macro expansion for the selected phrase. For example the phrase associated with an icon may be "The patient took his food" with the following modifier specifications (1) much earlier than normal time (2) slightly ahead of normal time (3) at normal time (4) slightly later than normal time (5) much later than normal time (6) The patient did not

take food. Pressing the icon along with modifier and the indicated number key will generate the appropriate modified phrase. This feature provides a lot of flexibility to the icon generation process.

Fig: 2 give the rough approximation of the input screen of iEd. It has a scrollable text area giving the generated text. Below this we have the icon keyboard, to represent each activity we are used corresponding icons by pressing one image button and one modifier button they can easily represent an activity, by pressing multiple buttons they easily generate draft document, then if they are making some modification in the document a grammar checker associated with it checks for grammar mistakes and finally saves that [4][6].



Fig:2: Tentative Sample Screen of iEd

Another possible extension to this work is we can use local language for entering this text document [5]. By using Malayalam language the nurse notes can be easily entered, [7] anyone can refer it easily for future purpose. Entered Malayalam text will be like the sample given below:

കാഴ്ചവലിയി തിരിച്ചറിയൽ രംഗത്തെ നൂതന ഐ സി യു വി രൂപംകെട്ടിയിടൽ . ഡോക്ടർ രംഗത്തെ പരിശോധിച്ച് ഡോക്ടർ സി രംഗത്തെ പരിശോധിച്ച്

6. Conclusion

We propose to implement the above as part of the ICU automation system in Jubilee Mission Medical College. The expected speed-up depends on the efficacy in creation of the icon set and the acquired skill of the user. The latter parameter will drastically improve over time and with a well formed icon set we expect speed up close to one order of magnitude over the virtual key board option. We propose to complete the development and present the results on the observed speed-up among the user groups at the end of this study. Once found successful, the idea can be implemented in other similar situations such as Sale deeds entered by document writers, Class notes taken by students, etc. However, these would require analysis of the document corpus for creation of an appropriate phrase set with matching icons.

7. References

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