Application Of Open EMR As Scheduler For Doctors Using Distributed Electronic Patient Record Concept: The Key Issues In Designing & Managing Patient Appointment

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Abstract— **Appointment scheduling systems are used by primary and specialty care clinics to manage access to service providers, as well as by hospitals to schedule appointments. Many factors affect the performance of appointment systems including arrival and service time variability, patient and provider preferences etc. Appointment scheduling system lies at the intersection of providing efficiency and timely access to health services. This research presents an Distributed Electronic Patient Record (DEPR) Medical Appointment Booking System. The system was developed using Asp.Net and MySql. Further we discuss about the integration of system with OpenEMR.**

Index Terms— **DEPR, Healthcare system, Online Appointment, OpenEMR.**

I. INTRODUCTION

Waiting time simply means a period of time which one must wait in order for a specific action to occur, after that action is requested or mandated [1]. Patients' waiting time has been defined as "the length of time from when the patient entered the outpatient clinic to the time the patient actually received his or her prescription". It is defined as the total time from registration until consultation with a doctor. There were two waiting times, the first is time taken to see a physician and the second is time to obtain medicine. This paper deals with the waiting time to see physicians.

A patient appointment system or appointment schedule for health care center started long time ago. Management of patients' appointments has earlier works and has developed simplified queuing models and fairly static scheduling conditions. Another attempt was made to calculate the waiting time between patient and doctor using the mathematical queuing models to minimize waiting time. However; traditionally the appointment system has considered that the doctor time is more important than patient time. So an appointment system was designed to minimize the doctor idle time but current designing of an appointment system is based on decisive factors with respect to both the patient and doctor [2]. Managing patient appointment system is a computer application used to manage and reduce the patient waiting time in the health care center. Some health care centers do not use any appointment system. So it has a longer average patients' waiting time than the health care center that adopts the patients' appointment system. While patients can wait for more than one hour to be attended to by a physician in a health care center, they also can feel that they are being disregarded

and treated unfairly [3]. So when patients are given the time of appointment in a health care centre, they can evaluate the quality of service in the centre.

The number of missed appointments in healthcare caused problems, hence the need for integrated healthcare system to intervene and provide seamless care for patients. Appointment scheduling system lies at the intersection of providing efficiency and timely access to health services. This research presents an online Medical Appointment Booking System in order to book an appointment with the corresponding time as specified by the available doctor. The system was developed using Asp.Net, and MYSQL. This is to ensure that the application is robust, and is able to run on different platforms. The system provides the platform to facilitate the booking and management of patients' appointment bookings. Patients can also view their appointment reports. It also provides the healthcare workers an easy access to manage patients' appointments and to generate relevant reports.

II. PATIENT APPOINTMENT SYSTEM IN OPENEMR

To schedule an appointment using the calendar system, click on the Patient/Client menu and when opened, click on Patients. This will display a list of patients within the system. Then find your new patient and click on the patient's name and the active record will be displayed.

Once you select your new patient, click the Calendar button on the top of the column of Menu options on the left of the screen. That returns you to the opening screen with the calendar display in the upper portion of the page. First click the desired appointment date on the small calendar on the left hand side of the screen. Second, go the daily calendar to the right and select and click on the specific appointment time for the patient. Third, a pop up screen appears and permits you to select either the Patient tab and/or the Provider tab. Once you create this appointment, click the Save box to complete the scheduling process screenshot shows the working of the scheduling of an appointment.
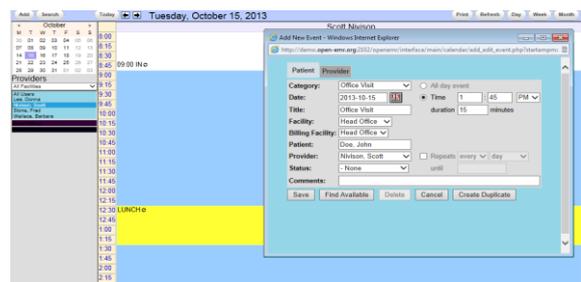
Screenshot1: Patient scheduling through the calendar
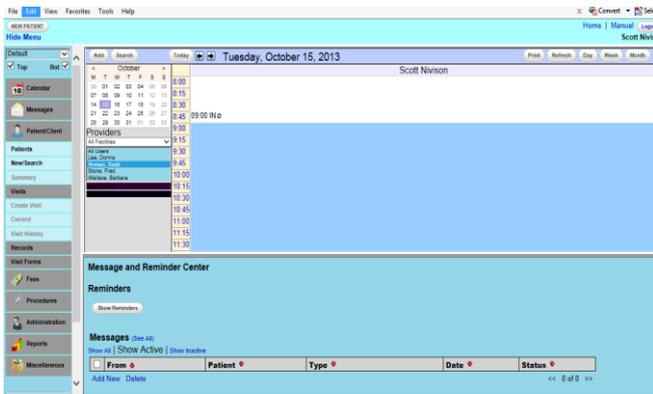
Screenshot 2: Opening screen with Patient/Client sliding button
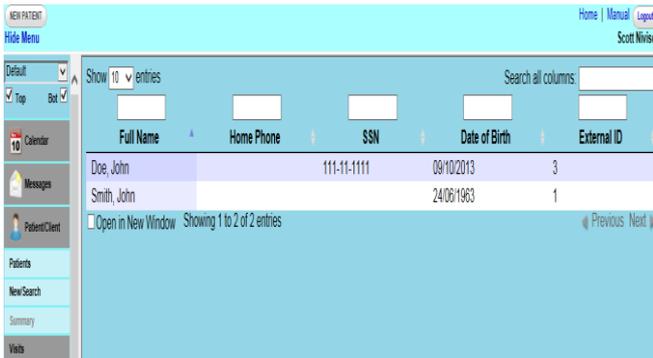
Screenshot 3: Patient list
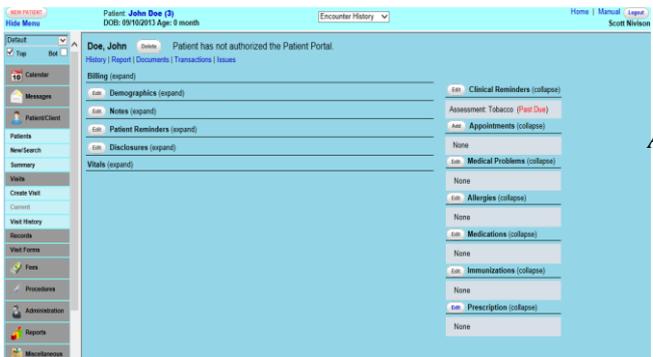
Screenshot 4: Patient Record structure

III. SCHEDULING AN APPOINTMENT USING DEPR SYSTEM

A. An Analysis

The research on appointment scheduling has a long history, starting with the work of Welch and Bailey [4]. Their most famous result is the so-called Bailey-Welch appointment schedule, which states that two patients should be planned at the start of the day, and the other patients evenly spaced throughout the day, to offset the bad effects of no-shows and patient lateness. Bailey [5] already announced that an appointment system is a trade-off between doctors' and patients' waiting times. Although outpatient clinic's average internal waiting times are long, doctors frequently have idle time. Patients who do not show up or who are late for their appointments cause idle time for doctors, leading to temporary underutilization of the outpatient clinic's capacity. Gaps in the appointment schedules also cause underutilization of the doctor's time [5].

We evaluated the performance of two different approaches the web base appointment system and the usual queuing method as shown in the figure 1.
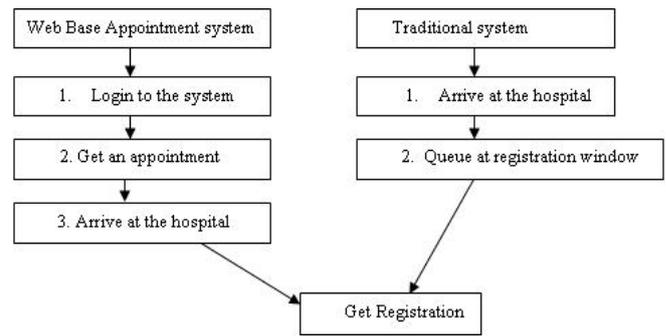
Figure 1: Flow chart of Registration Method

Some data is collected from appointment using the web based appointment and from traditional appointment method. Study shows that the web base system is more convenient than the traditional system it will manage and reduce the patient waiting time in the health care center.

In order to achieve the objectives of this DEPR research, the researchers personally observed the appointment schedule in hospitals. Also as a follow up, the manual appointment and booking method. In order to develop the online medical appointment booking system, Database was developed using MySQL for the system. In the process of developing medical appointment booking system, records were stored in the database. MySQL was used to create and populate the database. The medical appointment booking system was implemented using Asp.Net.

A. System Architecture

The system architecture o the DEPR online appointment system is shown in figure 2
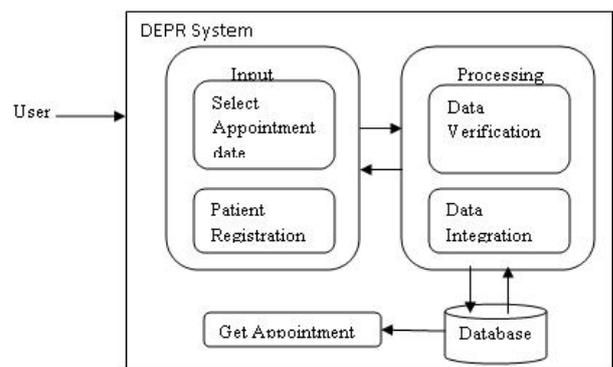
Figure 2: System Architecture of DEPR online appointment system

The user interface allows the user to navigate the system and communicate with the database. The system interface design is simple enough to be the use for anyone with little knowledge of computer operation and the system is user friendly and made easy to use through the use of Windows, Interface Menu and Pointing devices which is very important in computer graphics design. The inputs to the medical appointment booking system are captured through the user interfaces available in administrator's web account and the individual patient's web account. A login Menu, which contains a user-friendly interface for capturing valid registration code, username and password, is available for each patient to logging in to their various accounts. In each

patient account, data pertain to the patient and available doctor are entered and appointment booked are submitted. All these captured data are stored in the database.

The following screenshots shows the execution of DEPR online appointment system:

Screenshot 1: Select the scheduled date appointment i.e Dec 30

Screenshot 2: Registration of the patient
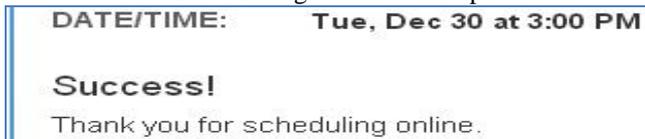
Screenshot 3: Successfully Schedule an appointment

IV. PROSPECTIVE WORK

As the online appointment application is present in both the system i.e in DEPR and OpenEMR, our aim is to integrate both data and form an interface between both the systems so that we can organize both the databases. first of all we are managing the online appointments in both the system at earliest stage as shown in figure 3:
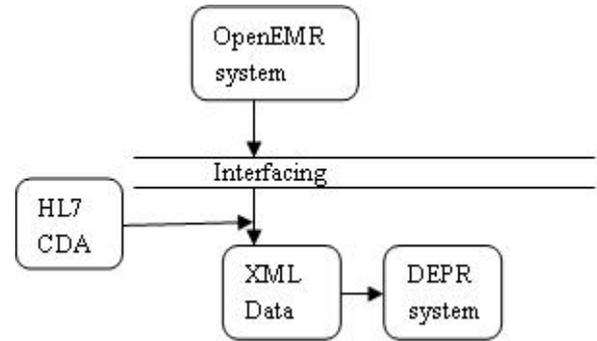
Figure 3: Interfacing in between OpenEMR and DEPR system

V. CONCLUSION

In this paper, we summarized key issues in designing and managing patient appointment systems for health services. With the development of web based DEPR medical appointment system, patients are able to book and manage their own appointment with ease. Patients could also track and monitor their own appointment record with this system. The system is mainly designed to facilitate appointment booking between the patient and the health personnel. Time will not be wasted on converting paper-based appointment record into electronic-based. The system further helps to reduces healthcare personnel workload by allowing them to generate medical reports easily. We will continue to improve and develop the system with goals to integrate the system with OpenEMR

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