Appointment Scheduling Using Mobile Device

Nagendra[1], Nandish Asangi[2].
[1,2] Student MCA IV Sem Section 'A'
Department of Master of Computer Applications,
RV College of Engineering, Mysore Road,
Bangalore – 560059
[1]nagendras1990@gmail.com, [2]nandish.asangi@gmail.com

Sandhya S
Assistant Professor
Department of Master of Computer Applications
RV College of Engineering, Mysore Road,
Bangalore – 560059
sandhyas@rvce.edu.in

Abstract—**The Planning and scheduling requirements of hospitals have changed dramatically. In the past diagnosis and treatment were based on individual knowledge and skills, whereas, they have nowadays increasingly changed due to number of patients and health awareness that has almost doubled. The hospital organization has become far more complex; and resources are now so expensive that their full utilization is must. Competition and economies of scale achieved by mergers are the order of the day and lead to sub-specialization, demand for improved customer services, and cross-hospital planning needs. This android based Patient Appointment and management application is the easiest way to book and manage appointments from android devices to reduce the patient work for his convenience. System provides set of front ends to one-one communication for people who involved in medication process. As system is running, the data is produced by each front end will be sync with database which resides on hospital server. System provides complete control to manage patient flow and their medical services related communication has done just using mobile phones by proper way of mobile data synchronization and ensures acknowledgements. System generates time slots for doctors and resources in hospital according to hospital policy and also gives customizable options to optimize the utilization of resource.**

Keywords-androidOS;synchronization;smartphone;app;mobile computing;resources;appointment;

I.INTRODUCTION

Initially mobile phones were developed only for voice communication but now a day the scenario has changed, voice communication is just one aspect of mobile phone. Android is a Linux based open source operating system. Around 75% of the mobile market share is covered by android. Every day more than 1 million new Android devices are activated worldwide. Android gives you a world class platform for creating apps and games for Android users everywhere, as well as open marketplace for distributing them instantly [13].

The benefits of online scheduling system for both administrative staff and patients and other booking individuals include: recording and record-keeping capabilities that make it quick and simple to access data associated with a specific appointment; and repeat patient reminders, which the system sends out automatically when a specified amount of time has expired between appointments. A device armed with computing power, mobility and downloadable "apps" that has become common place within the medical field as both a personal and professional tool. The popularity of medically-related apps suggests that physicians use mobile technology to assist with clinical decision making, yet usage patterns have never been quantified. This information should be used to guide the development of future healthcare delivery systems; expanded app functionality is almost certain but reliability and ease of use will likely remain major factors in determining the successful integration of apps into clinical practice [11].

The rapid adoption rate and integration of mobile technology (tablet computing devices and smartphones) by physicians is reshaping the current clinical landscape. These devices have sparked an evolution in a variety of areas, including educational media dissemination, remote patient data access and meet-for-care applications [12]. Data regarding respondent specialty, level of training, and habits of tablet usage were collected and analyzed. 40 % of respondents used a tablet, of which the iPad was the most popular. Nearly half of the tablet owners reported using the tablet in clinical settings; the most commonly used application types were point of care and electronic medical record access [12].

The flexibility of this online android based scheduling software enables it to be utilized for a variety of different services and activities at medical, healthcare and wellness facilities, such as: Scheduling patient appointments, treatments and services, Booking appointment and inoculation clinics, patient's events and activities. System by considering both direct and indirect patients who come to hospital for different medication services, manages them by giving prioritization for each. System introduces a systematic approach to patient allocation to the specific doctor by creating fixed slots.

II. EXISTING SYSTEMS

In most clinics and hospitals web based scheduling an appointment with doctors is far more frustrating than it really needs to be which is seen by experience. He's either unavailable due to other obligations or is sometimes unknowingly booked for that time. This can result in a lot of complaints and negative feedback on the hospitals. The issue of double or over booking can lead to a lot of confusion when a

doctors works in multiple hospitals especially if bookings are not coordinated carefully. There is no spontaneous response received to the patient regarding their booking of the appointment. There are not even any confirmation messages given to the patient regarding their scheduled appointment.

A. Existing mobile apps

The mobile apps used to hospital are just to book an appointment. Once appointment is took place everything is discarded in system. There is no support of communication and instant data transfer from doctor to nurse or other people who involved in hospital to diagnosis the patient.

MyClinic[16] application is developed for Android and iPhone platform that automates the work of patient appointment scheduling and greatly reduces the manual work[16]. MyClinic allows the patient to get an appointment with the doctor. But the application is limited to just to get appointments and it doesn't take care of environment inside the hospital. System doesn't support prior block of slots assigned to doctor, doesn't gives table representation of each doctors slot allocation list.

Other patient appointment software doesn't support the admin and doctors communication facility in their mobile applications.

III. PROPOSED SYSTEM

Patient has to open an account in hospital database to register for this facility. He can create an account using app or hospital website or manually with the help of hospital staffs. Once user account is successfully created on hospital database user can do the following operations through the android application.
1. Login to the system.
2. Book an appointment with specific doctor.
3. Communicate changes instantly
4. View and manage availability and requests
5. View his History, events and activities.

In process of booking an appointment through the phone involve few steps, confirmation messages from request to get an acknowledgment; as shown in *figure 1*.

In hospital end the following operation to be done using this mobile application. Authentication to user, Maintain doctor's availability, Booking and cancelling appointments, Patient visit history, Reports of patient. Information technology allows appointment scheduling through secure online access using the Hospital's web site. (In the case of online appointment requests, the patient's email address is necessary.) If online appointment scheduling is new to the clinic, the medical assistant may ask if the patient is willing to use the android devices for online appointment scheduling for the upcoming visits.

The database will get updated accordingly and the patient will get a confirmation message. The add-on to this system is that the patient will receive a notification in morning of day of appointment and 3 hours before the actual appointment. This will be very useful in case the patient tends to forget the appointment. Doctor's prescription and diagnosis will be updated in database as soon patient treated by the doctor and also information will be sent to specified staff of hospital if their assistance is needed [*figure 2*].
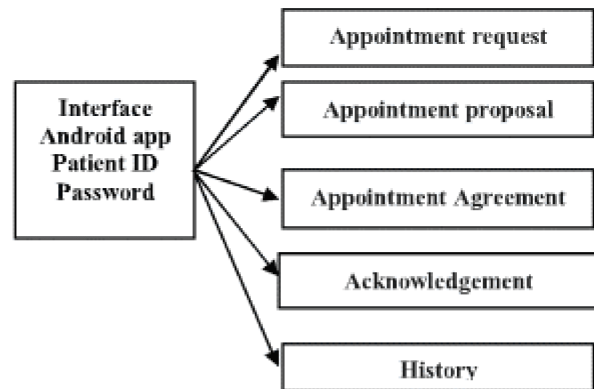

Figure: 1. Outline of a set of the speech acts. Steps involved in successful appointment booking. And End user information access (patient) through app.

Most of the problems are reduced if scheduling is controlled by a hand held device anytime and anywhere. Although patient appointment scheduling may seem like a routine function, a smooth patient flow often determines the success of a day in the ambulatory care setting. A variety of administrative skills are used in the performance of this vital function. By effectively scheduling patients to fit a particular practice, it is possible to make profitable use of provider and staff's time.
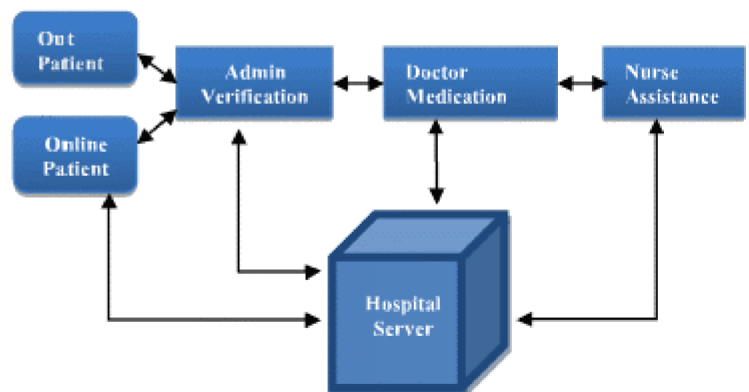

Figure 2: figure shows Communication flow takes place inside the hospital using the mobile device.

A. Evaluation and allocation of appointment time slots

We consider both direct and indirect patient delays and provide a synthesis of previous research pertaining to all the scheduling environments mentioned earlier. Moreover, our approach views the scheduling problems arising in the three environments as different application domains within a common underlying modelling framework. That restrict number of appointments to be made through software is depend upon hospital service capacity and provides Customizable options, So that the indirect patient waiting is handled properly.

B. Prior Blocking of slots

System also provides the facility to doctor to block the needed slots. If the doctor has blocked the slots, the slot result will be replicated in free slot list. And those blocked slots will be not available for patient allocation. Service providing for already booked patient is complex process. We cannot predict the time taken by each patient. It is depending upon how doctor manages with patient.

To reduce the inconvenience of unavailability of doctors, the day first of each month, number of slots will be created for specific doctor according to hospital's policy. Doctor can block the particular slot for his unavailability [figure 3].

The doctors are given notifications of their appointment details. The service providers chemist can accept E-prescription from different patients the pathologist can upload the reports of the patients for the performed tests through the application. Different record related to patient and his diagnosis reports are stored in database instantly [figure5].

Dr.Ramesh	23-3-2014 to 30-3-2014			
	9.30-10	10-10.30	10.30-11	11-11.30
Sun	Mr.Reddy		Mohit	Kumar
Mon		Mrs.Pari	Mrs.jaya	Pallavi
Tug	Praksh		Suman	
Wed				
Thu			Mr.sagar	
Fri	Mr.Gagan	Mrs.Anni	Mr.Prabh	Mr.Jha
Sat	Mr.Rajesh	Mr.Jaga	Mr.prem	

■ Blocked   ■ allocated   □ vacant

Figure 3: Slot trey for the Doctor for specific week. Figure shows number of allocated, blocked, unallocated slots of Dr.Ramesh.

C. Appointment synchronization and prioritization

To maintain consistency of stored information and to avoid redundancy can use time stamp. Synchronization proceeds by transferring all data with a timestamp later than the previous synchronization. Maximum priority is given to first come first serve manner.

The android application will use HTTP to connect to the server. The data is stored on a live server space of hospital. After validation, the application will allow the user to access his information. [14].

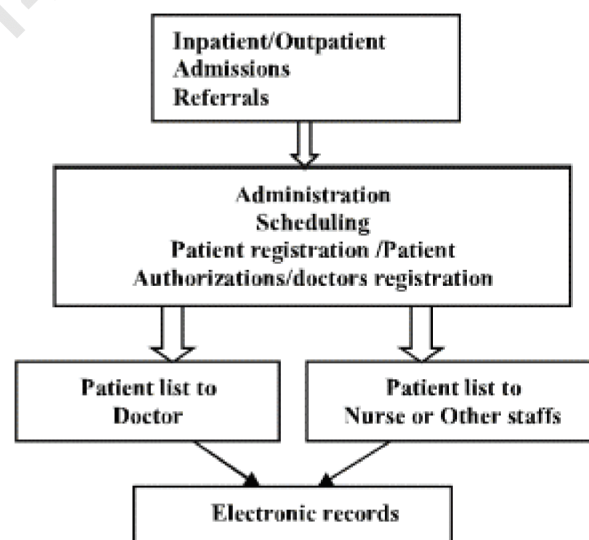Figure 4: Data synchronization of mobile app with hospital server database.

Figure: 5 Total practice management software diagram showing the relationship of scheduling activities to a patient's medical record.

D. Figures and Tables

Constraints	Manual	Using hospital portal	Mobile App
Time	15%	10%	6%
Manpower	12%	10%	4%
Recourse utilization	60%	60%-80%	70%-90%

TABLE1: Shows the hospital resource optimization and development in percentage from traditional to mobile app approach.

Hospital	No of doctors	Slot Duration	No of days/week	No of blocked slots	total no of slots
ABC	10	20	5	40	960
DEF	12	20	7	40	1640
GHI	20	20	6	60	2340
JKL	50	30	6	70	8930
MNO	100	10	6	180	5820
PQR	150	30	6	220	26780

TABLE 2: Shows the study of effective slot (time period for 1 patient) generation and count of number of slots which allocated for number of patients by considering hypothetical situation(considering 1 week).
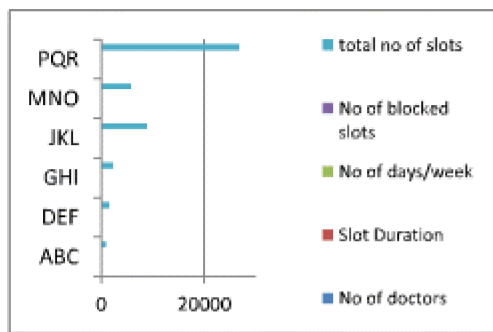

Figure: 6 Graph for data of table 2.

Hospital	Total no of slots	No of out patients	slots available for online patients	AVG online request	slots left-out
ABC	990	400	590	500	90
DEF	1660	600	1060	740	320
GHI	2380	900	1480	900	580
JKL	8940	2000	6940	4000	2940
MNO	5850	2300	3550	3000	550
PQR	26800	10000	16800	14000	2800

TABLE 3: shows weekly generated slots reserved for outpatient and available slots for online patients.
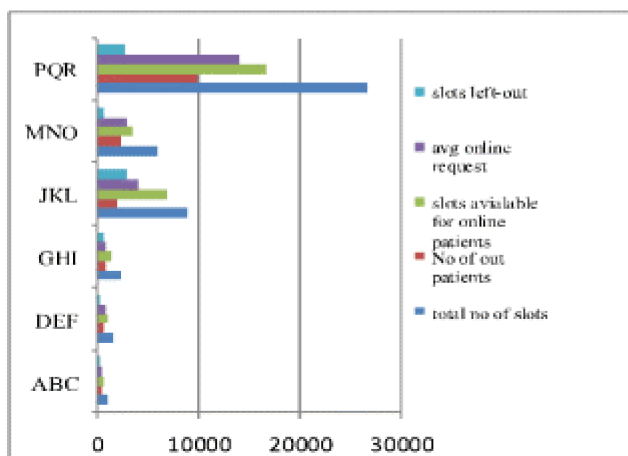

Figure:6 Graph for Data of table3.

E. Information Security

Different people involved in appointment and treatment process of patient have different set of privileges, restriction to access the information about the patient. So that information security can be ensured.

Patient Information	Patient	Admin	Doctor	Nurse/ Staffs
Name	Yes	Yes	Yes	Yes
Contact	Yes	Yes	No	No
personal info	Yes	No	Yes	No
Address	Yes	Yes	No	No
Treatment History	Yes	No	Yes	No
Treated Doctors	Yes	No	Yes	No
Disease summary	Yes	No	Yes	No
Treatment summery	Yes	No	Yes	No
Current Treatments	Yes	No	Yes	Yes

TABLE 4: table shows data view privileges for people who involved in medication process. Data security level for different roll actions.

IV. RESULTS

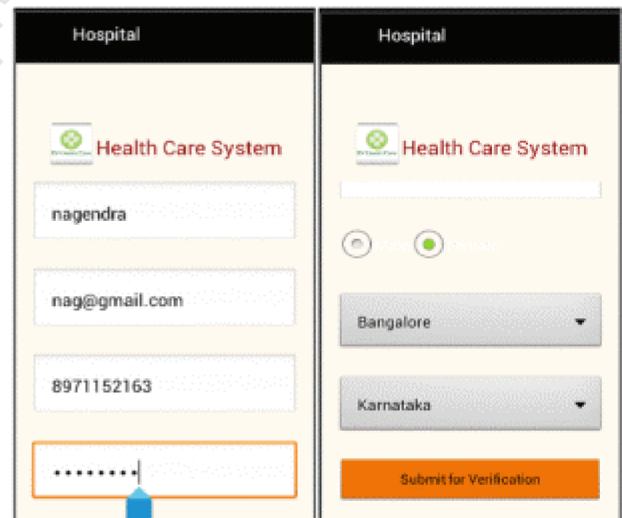Following some screenshots shows the mobile app front end forms.

Figure 7: App screen shot for new patient registration. when patient first time requesting for appointment, he has to fill the all mandatory information. It create new account with username and password.
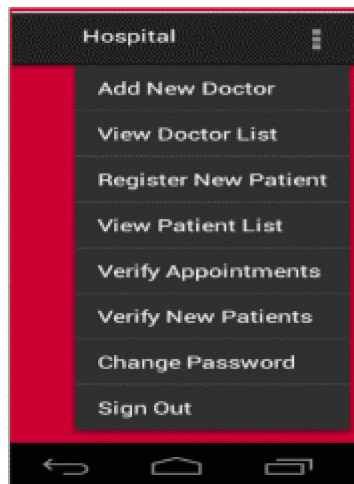
Figure 8: screenshot shows the different options given to the hospital admin to manage and verify the appointments.
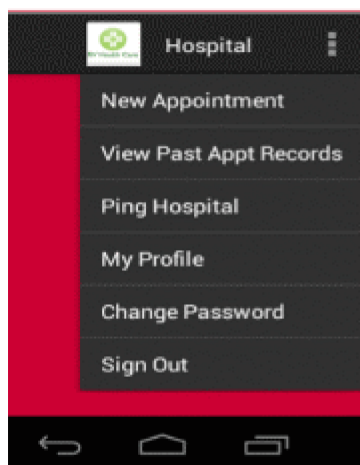

Figure 9: screenshot shows the different options given to the patient once he created account in hospital server.

V. CONCLUSIONS

The benefits of implementing this technology touch everyone involved in the scheduling process, as administrators and staff can conduct their tasks more efficiently and accurately, while customers and clients have the ability to book their appointments and reservations quickly and more conveniently. The application will prove very beneficial to doctors and patients, user friendly and easily accessible. Also it will save time, reduce the effort and paperwork of both patient as well as doctor. This application effectively schedules patient appointments and patient flow management in the hospital using mobile device.

VI. ACKNOWLEDGMENT

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