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**Reducing Waiting Time of Outdoor Patients in Hospitals Using Different Types of Models: a Systematic Survey**

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**ABSTRACT**

*This paper surveys different types of issues which lead to increased waiting time in Hospitals. Hospitals have opted for a variety of techniques to deal with such functional and structural problems to help reduce Waiting time for Outdoor patients to improve upon Patient satisfaction and overall efficiency. Applications and contributions of different types of Operations Research Models in Health Care field to overcome the waiting time issues faced by Outpatient in Hospitals have been further discussed in the paper. Also, use of electronic health records and practice management tools by Medical practitioners to enable faster and more effective care to the patients and saving their valuable time has also been highlighted. The goal is to provide information to the Health care analysts who are engaged in improvement of hospital efficiency using an appropriate OR model. However, there is scope of further research in areas like lack of co-ordination between hospital interfaces, waiting time of patients queuing for special treatments in this field.*

**Keywords:** *Outpatient; Waiting Time; Queuing Model; Healthcare.*

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**1.0 Introduction**

A Hospital aims to serve the patients in the most effective manner when he is in the utmost need of it. A person visits a hospital when he needs treatment in the shortest possible time and the last thing he would want is to wait. However, with the increasing demand of healthcare services, he is bound to invest so much of time simply waiting in the hospital queue. Waiting in a queue in hospitals remains the most significant problem faced by our health care system. The government health care system has been facing the issue due to limited capacity. While the private sector in health care, although trying to keep pace with the increasing population and so the requirement of the health care services, yet facing problem of waiting lines due to overcrowding and congestion in the system. If such problems are not dealt with effectively, it could lead to huge loss to human life.

Nowadays customer care in all the organizations particularly the health care organizations has advanced and progressed and has a specific symbol. A Comprehensive factor for the patients in the health care organizations is actually the

criteria considered for the suitable and desirable treatment which is rapid and suitable. Prompt treatment in a hospital means to minimize the time for getting a health service with an emphasis on the favourable treatment (Dansky & Miles, 1997). Changes and major challenges in the health sector have led to the changes in the outpatient services showing the appropriate management of these centers (Vissers, 1998) Effectively managing patient flow in an outpatient unit is a key to achieve operational excellence as well as ensuring clinical quality. That's essentially true for an outpatient department in a large hospital as it handles very large volume of patients with a diverse case mix (Mardiah & Basri, 2013)

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 leaves the OPD". [1] Dansky presented several definitions for the waiting time. Few definitions also refer it to the total time that a patient spends to receive a particular service since entering to the hospital till entering the examination room to visit a doctor. (Leddy, 2003). Waiting time is defined as the total time from registration until consultation with a doctor. There are two waiting times, the first is time

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taken to see a doctor and the second is time to obtain medicine (Jamaiah Hj Mohd Sharif, 2003). Registration time i.e. time including the payment process and record classification made is also part of patient's waiting time. This aspect of waiting time can be dealt with the new techniques of reducing waiting time. The other aspect i.e. waiting within the hospital can be reduced only through basic interventions approaches including deploying appropriate work force including doctors, staff etc.

In the 2004 federal Throne Speech, it was stated by the British government that the length of waiting times for the most important diagnoses and treatments is a litmus test of our health care system [and] to reduce these waiting times appropriate steps must be taken. Quality improvement in Health care based on Patient Satisfaction, takes place only when there is a process based on management. The process of appropriate management of waiting time in Hospital is an example of the same.(Boudreaux, 2004). Effectively managing patient flow in an outpatient unit is a key to achieve operational excellence as well as ensuring clinical quality. It is completely true for an outpatient department in a large hospital as it handles very large volume of patients with a diverse case mix (Mardiah & Basri, 2013). In a Recent study, it was revealed that the average wait time in American hospital emergency rooms is approximately 4 hours, which reflects the intolerably low value and service in a hospital. In a patient satisfaction survey conducted by Ernst & Young in Germany in 2010 [2], waiting time had scored worst among all key quality indicators measured by the study. Most of the respondents who had received medical care in any hospital indicated that they have been disappointed with this important issue. Waiting is a pervasive problem in most hospitals and it is much more common compared with other types of service too. Waiting is a consequence of the mismatch between the available hospital resources and the needs for care. This mismatch may be attributed to having insufficient resources to meet demand for health care. But the lack of planning, coordination, communication in delivering health care services is also the reason why resources and needs are not adequately synchronized with each other.[3]

This paper surveys such type of issues which have lead to increased waiting time faced by Out Door patients. Various types of Operation Research

Models have been applied to deal with the problem of waiting time in the Health Care sector. Some of them have been discussed as under,

## **2.0 Patient Flow**

With the increasing population and furthermore older population, the no. of patients has been growing exponentially and has uncertainty depending upon the different occasions. This makes it difficult sometimes to find out how best the patient flow be managed so that there is no time lag and there is minimum waiting time experienced by the patients.

Yeon, et.al [4] found patient flow is a major element in improving efficiency in the delivery of healthcare services. Patient flow has a development in a patient's health status. Patient flow administration requires addressing three aspects of an outpatient unit: arrival of patients, service process, and queuing process. Operating on the patient's arrival includes controlling its patient group size, balancing patient volume across available sessions and achieving desirable patient arrival pattern within a session.

Hospitals essentially operate as a collection of independent departments that compete for restricted resources. The coordination of processes within the patient flow is difficult to achieve. T. Melo et. al[3] found that in a high-cost unit such as the operating theatre, schedules for elective surgeries are usually created without analyzing their effect on other hospital departments such as diagnostic units (e.g. medical imaging and laboratories), nursing wards, and recovery rooms. The lack of dexterity results in the underutilization of expensive resources (staff and equipment) and in delays in the patient flow. Moreover, it contributes to increased patient inconvenience due to longer waiting times. Hospitals are not aware of the importance of determining the earliest point in time at which the relevant information becomes available to order resources required further down in the patient flow.

It came to light that a Children's Hospital in Miami faced a similar problem when it experienced an increase in patient volume, escalating the scheduled monthly visits to 4,800 patients. In addition, the hospital experienced an unscheduled volume of 1,900 patients per month. This added volume drove up wait and discharge times, negatively impacting satisfaction levels and, most importantly, patient care. One of the key issues faced by the

hospital included High patient wait times particularly in the areas of triage, admissions, data entry and insurance verification.

### 3.0 Admission System

In appointment systems, the basic problem is that the stress is laid on minimising the idle time of the doctor and not on patients waiting time, wherein the two parameters are equally important to mark an efficient appointment system. [5] This was the problem was first tackled by researchers such as Bailey et al [6], Jackson et al [7] and by Vissers[8].

In most hospitals, appointment systems are used to schedule patient appointments for seeing the doctor or for medical examinations. Any patient who schedules an appointment faces two types of delays. Virtual delay is time between request of appointment and actual appointment schedule. Other is, after arrival for the scheduled appointment caused due to Emergency cases or unscheduled patients. This direct waiting time is the greatest source of dissatisfaction.

The process of assigning time slots for serving out and in-patients arises in diagnostic and treatment units that deals with uncertain service times, no-shows, cancelations, and walk-ins. T. Melo et. al[3] said that a good appointment schedule ensures shorter patient waiting times and lesser staff overtime considering the patient load and the resources like staff, rooms, and equipment available at a given time. Commonly used approaches fall into four categories: mathematical programming (deterministic and stochastic), heuristics, queuing theory, and simulation.

In a revelation involving Phoenix Veterans Affairs Health Care system, at least 40 U.S. veterans waiting for appointments died due to lack or delay in getting appointment in VA Hospital. This secret was part of an elaborate scheme designed by Veterans Affairs managers in Phoenix who were trying to hide those 1,400 to 1,600 sick veterans who were forced to wait months to see a doctor, according to a recently retired top VA doctor and several high-level sources.

For six months, news channels have been reporting on extended delays in health care appointments suffered by veterans across the country and who died while waiting for appointments and care.

### 4.0 Retrieval of Patient Information

The area of information technology has focused to the development of modern hospital information systems (HIS). These systems have been designed to deal with all aspects of information processing in a hospital which enable the collection, storage, management, and retrieval of data related to the all aspects of providing services within the hospital starting from clinical, financial and administrative. However, the use of relevant resulting surplus information to make correct decisions has received much less attention. Most HIS lack planning tools to support decision making.

Aghazadeh et. Al [9] said that Hospital Information System (HIS) helps in supporting hospital activities at strategic, practical and Tactical level. In other words, goal of hospital information system (HIS) is using of computers and communications equipment for collecting, storing, processing, readout, and communication between patients cares with administrative data on all hospital activities and comply needs of all consumers system. In academic hospitals research and training support is also one of the hospital information system (HIS) goals.

In India, C-DAC's Sushrut, a Hospital Information System (HIS) has been developed with the objective of streamlining the treatment flow of a patient in the hospital, while allowing doctors and other staff to perform to their peak ability, in an optimized and efficient manner.

It helps proper flow of patient information within different Departments at all levels and care of patient with a PC: using of the appropriate Work station, physician can access patients and hospitals easily from your location or where he/she is present. Better patient management and follow ups can be done better in these systems .Therefore, access to patient history will be better and faster. Some of the reasons to use a HIS are Data Presentation, ease in taking appointment in Hospitals, better communication of information and decrease the time and errors. Main features of these systems will be their vast capacity in collecting, recording and retrieving information that will provide monitoring the patient. Patient data keeps on being added at each level where the patient is directed, be it a doctor or examination reports.

## 5.0 Examination Process

Auxiliary services such as those provided by logistics seem simple and straightforward and hospitals do not really consider them as part of their core processes. However, they impact significantly on the quality of health care provided and on hospital costs. For instance, late delivery of an inpatient to a diagnostic department due to a late booking of the request for transport disrupts the planned schedule of the department and results in reduced patient satisfaction. Often, a new appointment time is set, thus rendering patient waiting time inevitable.

T Melo et. al [3] said that it is a common practice to assign same appointment time to several inpatients as a means to avoid idle time in case of patient no-show or tardiness. The latter aspect was a consequence of lack of coordination with the patient transport service for bringing inpatients to the radiology department and escorting them back to their nursing wards.

Also, in the Monthly Performance Report, National Health Service, Department of Health, UK in August 2011, it was revealed that the number of patients waiting for diagnostic tests such as ultrasound or X-Ray, has been growing every year. A maximum duration of 6 weeks has been the recommended waiting time for the one or up to 15 diagnostic tests including the ones required for detecting terminal diseases like Cancer. The report showed that 11,119 people have been waiting for more than six weeks at an NHS Hospital for a diagnostic test, which was almost double of 5,795 patients waiting a year ago. Also, there was a six times rise in the number of patients waiting for more than 13 weeks from 2010 to 2011. [10]

## 6.0 Emergency Cases

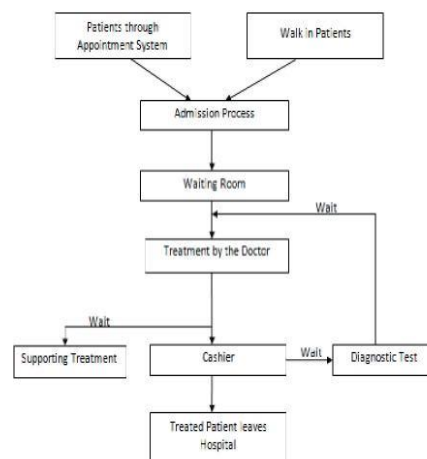
Patients are usually scheduled at equal intervals and that each patient requires a fixed duration of examination time. However, emergency requests interrupt a patient's examination and the latter has to start it all over after such an interruption. It varies from seeing the doctor first in the trade-off between emergency and outdoor patient or a doctor could be using the equipments for carrying out medical examination where they may be shared with the emergency department. The equipment is readily made available for emergency cases interrupting the

examination of scheduled patient. When all emergency examinations are carried out, then the interrupted process could be reinstated. [11]

Fiems et al. [12] investigated the effect of emergency requests on the waiting times of scheduled patients by determining the processing times. In this anticipatory repeat priority queuing system, the scheduled patients are interrupted by the emergency patients and the service is restarted for the scheduled patient as opposed to being resumed after the service of emergency patient. This paper models a single server queue and divides time into equally long slots. Emergency interruptions are considered to have no vacant time i.e. no server available from the point of view of the scheduled patients resulting in a discrete-time queuing model with exhaustive vacant times.

Paulien M. Koeleman et. al [13] found the optimal arrival times for a combination of patient waiting time, doctor idle time and tardiness. He presented a model for finding optimal appointment schedule in a hospital with frequent emergency arrival interrupting the scheduled patients, using local search algorithm.

**Fig 1: Flow Chart of Outpatient Visiting a Hospital**



Major challenges faced by hospitals over the years have led to development of plethora of management techniques which range from implementing queuing models, installing scheduling software to application of Six Sigma approach to deal with the increasing waiting time of Outpatients.

Further, different types of models used by hospitals to minimise outpatient waiting time, have been discussed

## **7.0 FIFO Model (First in First Out)**

This technique is known as the queue priority and is also compared with the queue of getting food. FIFO technique is another approach used for the analysis of the waiting time of the outpatients and how to reduce it. A low priority patient admitted first could be the last person who gets out of the admission queue in case a patient with higher priority arrives. This model can be applied to the cash department and examination room in hospitals. The patient admitted first will be the last person exiting from the examination room. This technique is mostly considered for the emergency department as priority plays an important role there.

However, Ozturk et al [14] said that this technique is used in the entire process from pre-admission till the exit of the patient from the examination room. This happens due to the priority levels of the patients in different departments. When we apply FIFO model in the Emergency department of a hospital, the primary care patients get delayed as there is a priority discipline for different category of patients in it.

Helbig et al. [15] established that sometimes the specific Time duration for each low priority patient's visit by doctor is as short as 5 minutes which should be at least 15 minutes for each patient. Looking at the amount of fee paid by the patient for consulting the physician and the money spent on several Diagnostic tests, it is the patient's right to get examined for a longer time. Perhaps one of the reasons behind the frequent visits of patient to the clinic is the shorter time duration which is spent on them. In addition to it, this duration of time indirectly increases the waiting time of the patients. If the hospitals environment is pleasant enough that the waiting time of patient's is converted from pain to a state of joy and comfort, then it may be compensated for the prices paid by the patient. However, the money spent is for consulting a doctor not to enjoy the perfect ambiance of the hospital.

## **8.0 Admission Model**

In admission model, a patient should not have any wait time at all before admission. A reservation system that functions in two ways helps in implementing this method. In one way, patient

admission is done through telephone. In this method, the patient contacts the hospital by phone and provides basic information to reception and gets admission into the queue, thus approaching the hospital at a given time. Another reservation system is through the computer, wherein the patients enter their basic information in the website of the hospital and get an appointment scheduled, thus entering the virtual queue and reaching at the time of scheduled appointment.

Software for taking hospital appointments have been developed so far in areas like E-commerce, m-commerce etc. The internet initially revolutionized communication and access to information; however, in more recent times there have been rapid improvements in mobile technology that has further expanded the communicative abilities of individuals and businesses alike. Mobile technologies and use of the internet have given us a new frontier of information distribution. A system has been developed recently for health care services for searching and scheduling an appointment using a J2Me mobile handset. [16], [17].

Arthur Hylton III et. al[18] developed an intelligent agent based system using android which was 1 st of its kind of research. It is a software which can be accessed in mobile environment for fixing appointments in respect of health applications by applying mobile agents (software) which would replicate the job of the human being as it has the ability to sense an environment that it is located in, then carries out some action, based on the information / data that it gathers from that environment and schedules the appointment based on the level of priority of the patient.

Wenjun Cao et. al [19] showed that in Xijing hospital of China, patient appointments were booked through the general Queuing system of appointment and a Web based appointment system, but in both cases, a major difference appeared in the degree of patient satisfaction, total waiting time etc. It was noted that the outpatients have not been using the Web based appointment scheduling system rather than traditional methods.

Reasons for not using the online appointment system were ignorance, not trusting the internet, inability to use a computer. However, using the Web based appointment system instead of the usual queuing method could significantly increase the

patient satisfaction level and reduce the total waiting time effectively.

### 9.0 Queuing Theory

This model is used when the number of outpatients is very large. Helbig et al. [15] analyzed a learning hospital in Frankfurt and suggested that there should be an increase in the patient admission booths and an increase in the number of examination rooms. Also, adequate human and physical resources should be present. This model is used in learning hospitals mostly.

Researchers such as Bailey et al [6] and Vissers[8] used this approach of formulating the problem as a Queuing system when there is a large no. of patients waiting in Queue, and Jackson et al [7] used queuing theory and simulation to put the system in place, by developing queuing networks dealing specifically in open queuing networks.

Sam Afrane et al [20] applied Queuing Theory and modelling to a queuing problem in out-patient department of a hospital in Ghana using a descriptive, observational and ex-post facto method of collecting data and modeled five types of Scenarios for different Server Capacities of its Outpatient department, compared their capacity utilization, average number of patients in queue and in the system, average waiting time of patients in the system using a software. Thereafter, using Queuing theory and Modelling as a tool in Decision Making, he proposed a minimum specified no. of doctors to be available and a user friendly computerized database system in the hospital for optimal performance of the system.

R. A. Adeleke et al, [21], studied queuing problems encountered at the University of Ado-Ekiti Health Centre, considering the waiting of patients in such university health centers as a single-channel queuing system with Poisson arrivals and exponential service rate where arrivals are handled on a first come first serve basis. It was discovered during the study that the traffic intensity i.e. the probability of patient queuing on arrival was high. Which clearly indicated that there is a higher possibility that the patient would wait for treatment as the doctor is busy examining the patient who arrived earlier. Hence, they proposed m/m/1 queuing system for such set ups and availability of more doctors and paramedical staff.

Queuing models have a big advantage that a complex queuing situation is changed into a simple

mathematical equation, which help in getting an optimal solution to reduce the waiting time. However, it needs to make irrational assumptions sometimes like person does not enters the queue at all as there are too many people already queued up. Also, if the analytic does not have enough background of Operation research, he/she might apply a wrong queuing model due to extensive nature of such models practically.

### 10.0 Electronic Visit System

Taylor et. al [22] said that electronic visit through the web network is the best present system to reduce the waiting time in hospitals and clinics. This model is obtained from the doctor's consultant and patient's relationship. These models are mostly used in hospitals and private clinics. The overhead costs of clinics have also been reduced by using these systems. Lack of patient, physician and consultant relationship in the emotional level has been a limitation of this system though. Such systems are mostly used in specialties such as psychiatry, where the doctor and patient meet only if it is necessary at times. The experts promote use of this system for family physician and the specialist relationship. This system is expanded and works on the patient, family physician and specialist. This system works quiet well in the developing countries and particularly in the developed countries where medical information systems and new applications are more advanced and extensive.

R Mohebbifar et. al[23] established that in waiting time for the outpatients of ophthalmology clinic with an average of 245 minutes for each patient allocated the maximum time among the other clinics for itself. The Orthopedic clinic had the minimal waiting time including an average of 77 minutes per patient. The total average waiting time for each patient in the educational hospitals under this study was about 161 minutes, and by applying some models, we can reduce the waiting time especially in the realm of time and space before the admission to the examination room.

In Mayo Clinic Health System in Iowa, an e-health system known as Mayo Clinic Care Network or MCCN has been developed, wherein patients, their physicians and specialists of Mayo Clinic are connected at different levels ensuring integrated clinical practice. It consists of like-minded

organizations that share a common commitment to improving the delivery of healthcare through high quality medical care. It ensures quick and convenient access to the expertise of Mayo Clinic so that patients can benefit without having to travel to a Mayo Clinic facility. MCCN's tools and services include AskMayoExpert, eConsults and eTumour, in which AskMayoExpert is a database for medical professionals who wish to gather essential answers to clinical questions with supporting information and key facts. It also offers concise information on how to manage a disease, patient care guidelines, treatment recommendations and reference reading materials for a wide variety of medical conditions. eConsults is a platform to connect the physician to specialists of Mayo Clinic for inputs on any specific question. By accessing the knowledge and expertise of Mayo Clinic, family physicians can improve locally provided care and keep their patients closer to home, avoiding unnecessary travel. eTumor board conferences for multidisciplinary review and informal advice. [24] Another such service is Medeo, used in British Columbia to electronically visit their physician through videoconferencing and also allows the physician to keep and share the medical records including photographs for further consultation. It offers doctors with the same services that clinics do, including appointment scheduling, billing, and record storage. Medeo is intended to connect patients with their current primary care physician/s if they sign up for the service. [25]

### **11.0 Process Model**

Willcox et al [26] said that process models are the best for identifying and solving the problems of outpatient waiting time in the hospitals. This model presents that the complete process should be examined to identify the problem in system Based on this, a management philosophy known as "Lean" was coined way back in 1988, which used the principles of Toyota Production System (TPS) that is focussed at improving upon the quality or value and eliminate the wastage. This process-improvement methodology and management improvement system has been used in many US hospitals to streamline their daily processes, improve upon finances, employee satisfaction and the most important factor, enhancement in patient care. It is directly acting on

elimination of waste. In terms of Lean, wastage is related to time and motion. There is no wastage of time and motion in this methodology which means increased productivity, efficiency, employee satisfaction, and patient satisfaction. Lean optimizes the clinical processes cutting out the unnecessarily wasted time due to mashed up clinical activities and needless motion.

R. Mohebbifar et. Al. [23] conducted a research in educational and learning hospitals in affiliation with University of Ghazvin, Iran and found that 7.53% waiting time was found to be related to the distance between the cash counters and the examination room and the patient's reception from the outpatient's reception till the entry into the examination room, The study suggested that the factors having more effect on this process should be considered more than other factors and the long term processes should be reduced or eliminated. For this purpose, acceptance model can be used before the admission. For Example, patients can be admitted by accepting the patients through simulation model. Also, in learning hospitals, the faculty physicians are mostly specialist and should begin counseling immediately after the admission of the first patient. It leads to greater utilization of time and they will get more time to examine the patient.

This model brings the system to optimal utilization of the resources available but it could be very difficult to do due to behavioral concerns of the people undergoing procedural change, as they may be aware or unaware of the need to change but display no interest in learning how to change as they are not considering change.

### **12.0 Simulation**

Simulations reproduce the behaviour of system under all types of operational conditions. With the help of simulation models, certain system variables are manipulated to determine their effect on the system and draw conclusions about how the system could work in the most efficient manner. It acts as a decision making tool needed to plan in the most complex and dynamic healthcare systems.

Mohamed Najib bin Salleh et. al [27] found that the outpatients flow is congested due to unbalance between the number of out-patients and the availability of doctors at a time in Jitra Health Centre



of Kedah. So, simulation model of outpatient flow was established to determine the bottlenecks for outpatients arriving at the centre.

A. Aeenparast et. al. [28] designed a simulation model for predicting the changes occurring in outpatient waiting time due to changes in system. The model used the data of arrival times, service times and flow of 357 patients in a learning hospital in Tehran. He analyzed 10 scenarios of changing patients admission time and changing doctor's work time with the help of this simulation model which was created using AweSim, a general purpose simulation system that uses Windows technology. The scenario that reduced the outpatient waiting time by 73.4% was finally chosen.

This model helps us in experiencing the grim situations that a system could face and find ways well in time to tackle such issues. However, a major disadvantage of this system is their cost and ease in using it, as some simulation programs lack enough flexibility for desired analysis.

Miscellaneous Approach Another widely used method for reducing waiting time of Outpatients has been taking Six Sigma approach by Hospitals.

It came to light that a Children's Hospital in Miami faced a similar problem when it experienced an increase in patient volume, escalating the scheduled monthly visits to 4,800 patients. In addition, the hospital experienced an unscheduled volume of 1,900 patients per month. This added volume, drove up wait and discharge times, negatively impacting satisfaction levels and, most importantly, patient care. One of the key issues faced by the hospital included: High waiting times of patients, particularly in the areas of categorisation, admissions, data entry and insurance verification.

Understanding the need for patient satisfaction, the hospital approached Genpact to analyze their current hospital operations and identify areas for improvement. Genpact applied the Lean (a process model), Six Sigma and Smart Enterprise Processes (SEPSM) methodologies, particularly meant for business processes, to core hospital functions with the goal of improving hospital efficiency and enhancing the patient experience and levels of care.

It resulted in better patient inflow and a more intelligent enterprise. Result of Genpact's innovative solution quadrupled the return on investment for the hospital through optimal utilization of equipments and infrastructure ensuring additional capacity, 18%

decrease in patient wait times and 3% increase in customer satisfaction.

In a university hospital in India, outpatients waiting time reduced significantly when DMAIC method under Six Sigma technique was applied to its cardiology department. Based on the analysis some improvements were suggested in the existing system such as increasing registration counters, appointing usherers for guiding patients, additional staff for taking telephone calls and imparted training of call attending mannerisms and conducting Voice of Customer (VOC) survey to get a reflection of patients expectations, which led to reduced waiting time and superior patient satisfaction [29] However, effective implementation of Six Sigma methodology is a concern as there is no proper guideline on how to do it.

Medical practitioners have also been opting for electronic health records and practice management tools to enable faster and more effective care to the patients and also saving their valuable time and money. Few examples of Electronic Health Record system have been discussed below: Electronic Health Record: With an Electronic Health Record (EHR), a patient's record is electronically maintained, which follows him everywhere, starting from the family doctor to a specialist physician to hospital and to any place from where he receives health services. And, he and his doctors can access all of this information and communicate with a smartphone or computer.

PedsConnect: It is a fully integrated paediatric electronic health record (EHR) and practice management system. It enables the paediatricians and other healthcare providers to efficiently access and share clinical patient data at all required points such as specialist doctor, hospital. It helps ensure that every child receives the most effective and immediate care. PedsConnect offers a full range of practice management tools that save valuable time and money of the doctor and patients both.

In Canada, Sunnybrook Health Sciences Centre has made an eHealth initiative, a service called MyChart, available to its patients. MyChart is also known as the Continuity of Care Record system and it streamlines the way health record information is delivered and exchanged between healthcare providers and patients in the hospital saving a lot of time which was earlier wasted in inquiring about a patient's history about disease and medication etc done so far. It helps doctor spend some quality time



with patient and making the most of it. Also, it minimizes time wastage and further reducing waiting time.

With many advantages, EHRs come with their own set of disadvantages such as finance issues, changes in work flow. Also, information privacy and security concern is a big disadvantage in incorporating an EHR.

### 13.0 Conclusion

It is quite known that in some way or the other, patients are dealing with the problem of waiting in a queue. There are different issues in all medical care units at several levels namely, Appointment systems, progressive Patient flow, Patient records, Examination procedures which lead to increased waiting time at each level leaving patients highly dissatisfied and delayed medical care. Hospitals are trying to tackle this shortfall in daily hospital activities, taking help of techniques such as queuing models, process models, Hospital Information System, Six Sigma, Simulations. However, issues like lack of co-ordination between hospital interfaces, waiting time of patients queuing for special treatments and many more, which must also be explored in future researches, along with studying the impact of emergency cases more extensively.

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