# To study the impact of Appointment Queue Management system (AQMS) on Pre Consultation waiting time and patient satisfaction over the conventional appointment system.

Dr R K Sharma[1]* Dr Anmol Arora[2]*

[1] Professor:Department of Management, Bharati Vidyapeeth University; Institute of Management & Research, New Delhi, India
[2] Ph.D Research Scholar, Bharati Vidyapeeth University; Institute of Management and Research, New Delhi, India

**Abstract :**

**Background:**Waiting to consult a doctor is very common phenomenon. It is usually observed that patient spend substantial amount of time waiting for the doctor consultation and due to this long pre consultation waiting,clinic become congested and patient and staff both become dissatisfied .
To overcome this problem of long waiting,the existing conventional system of appointment comprising of First Come First serve (FCFS) and Telephonic Token appointment (TTA)was replaced by Appointment Queue management system (AQMS). AQMS  an android application developed by Life on Internet Pvt. Ltd to help in managing the patient flow from the point of registration for the appointment up to entering the doctor chamber for consultation and presumed toreduce the pre consultation waiting time for patients and for creating an environment of ease for them. The study is undertaken to evaluate the impact of appointment queue management system (AQMS) over the pre consultation waiting time and patient satisfaction level over existing conventional appointment system.
**Method:** Cross sectional descriptive study was opted, patient who visited the AroraHomoe Specialties(AHS) over a period of one month from 1st April 2019 to 31st April 2019 were taken into consideration randomly for the study. The research instrument for a data collection was a structured questioner for assessing the pre consultation waiting time and patient satisfaction. Data collection was done by fixing each mode of appointment including First Come First serve (FCFS) ,Telephonic Token appointment (TTA)  andAppointment Queue management system (AQMS)for seeking appointment for 10 days each . Statistical Analysis was done on SPSS Vs 21.
**Result**: An appointment queue management system (AQMS) helps in efficiently managing queueand reducing patient waiting time. With its implementation patient received the right care at right time hassle free.
**Conclusion:** Maximum number of respondent subjects appreciated the appointment queue management system (AQMS) implemented at AroraHomoe Specialties( AHS) which has generated a positive impact on their experience while visiting the Clinicby reducing the pre consultation waiting time and thus increasing their satisfaction level.

## Introduction

AroraHomoeo Specialties (AHS) is a leading chain of Homoeopathic Clinic situated at North West District of Delhiwith clinical OPD load of more than 70 patients  daily. The appointment system being used at AroraHomoeo

Specialties (AHS) is a conventional appointment method which include First come first attended ( FCFA) and telephonic token appointment system .

The most common complaint what clinic administration come across at AHS is congestion at the clinic waiting area due to long pre consultation waiting time ,patient has to wait for long time for meeting and consulting the doctor .

In this service oriented health sector where patient overall experience with respect to both clinical and non clinical services is very important, these complaint among the patient regarding long pre consultation waiting time may develop dissatisfaction among the patient and may affect the overall image of the AHS.

To act proactively to meet up this challenge of attending patient in timely and efficient manner a well-designed appointment health care solution is needed over the existing conventional appointment system. A system which can eliminating the queues by improving staff productivity, Reduce patient complaint, reduce no show and improve patients experience cost effectively.

In this effort to facilitates patient and to improve operational efficiency of OPD at AroraHomoeoSpecialties , Appointment Queue Management system (AQMS) and its modules are tested with a presumption to transform the appointment booking experience of the patients and to reduce the waiting time and increase the patient satisfaction.

Thus to assist in this endeavor this research is designed to study the impact of appointment Queue Management system (AQMS)on Pre Consultation waiting time and patient satisfaction over the conventional appointment systemand to analyses effectiveness of AQMS , its acceptance, benefit, limitation and experience among the patient.

**Key words** :Pre Consultation Waiting Time , Appointment system, Queue system , scheduling system.

**Abbreviation**

AHS – AroraHomoeoSpecialities
AQMS- Appointment queue management system
FCFS – First Come First Serve
OPD – Out patient Department
TTA – Telephonic Appointment System

**REVIEW OF LITERATURE:**

The concept of appointment system originated in mid- fifties whenBailey and Lindley ( 1952) for the first time studied Outpatient appointment scheduling andstated that patients spend substantial amount of time in the clinics, waiting for services to be delivered by physicians and other allied health professionals.

This concept stated is still true and valid that the degree to which health consumers are satisfied with the care received is related to the duration and quality of the waiting experienceand its dissatisfaction increases with waiting time (Worrall 1974). Excessive waiting time is often the major reason for patients' dissatisfaction in outpatient services ( Huang 1994). The key to make waiting experience satisfactory is to make the waiting period short and to achieve this there is the need for several measures to reduce lengthy waiting times for quality improvement to improve patient flow within the clinic for ease of patient scheduling and processing ( HaykanushMinasyan 2003).

Philip Rutledge (1977) suggested that, there are two areas, which require improvement i.e long waiting time in waiting area of the OPD and unfair practice to call patient without their turn .

To overcome this problem require a well-designed appointment system having the potential to increase the utilization of expensive personnel and equipment-based medical resources as well as reducing waiting times for patients ( AT Harrison 1987) and adding to the clinical competence ( Jackson 1991).

Outpatient appointment scheduling is most often treated as a queuing system when people study appointment scheduling ( Creemers&Lambrecht 2009). But these appointment system requiresefficient handing by trained non-clinical staff, since there is the vital role of secretarial and reception staff in the running of successful appointment systems(Honeywood 1973).

This research study is to analyses Appointment Queue Management system (AQMS) and its effects on the overall patients' waiting time and patient satisfaction.

**Appointment Mode:**

1.  **First Come First Serve ( FCFS) :** Also known asFirst come first attendedis the most common mode of appointment system followed . In FCFS patient approach the clinic physically and get himself registered for his turn to consult the doctor at the reception desk. There after an appointment number is issued in sequence and patient has to wait for his turn. This appointment mode is excellent for the clinic with less number of appointment but the clinic with heavy OPD  , where number of patient visiting is high this appointment system is annoying since it leads to lot of waiting .

    This appointment system often leads to congestion at the waiting lounge of the clinic and is observed to be annoying and disturbing with long pre consultation waiting time. FCFS appointment mode is totally physically interactive mode of appointment.

    *Patient Flow Chart 1.*

    *Flow of patient's movement at AHS from arrival to departure with conventional First Come First Serve Appointment Mode .*

    CONTACT RECEPTION DESK PHYSICALLY

    REGISTERED IN APPOINTMENT REGISTER

    FIRST COME FIRST SERVE ( FCFS )

    PATIENT WAIT FOR HIS TURN

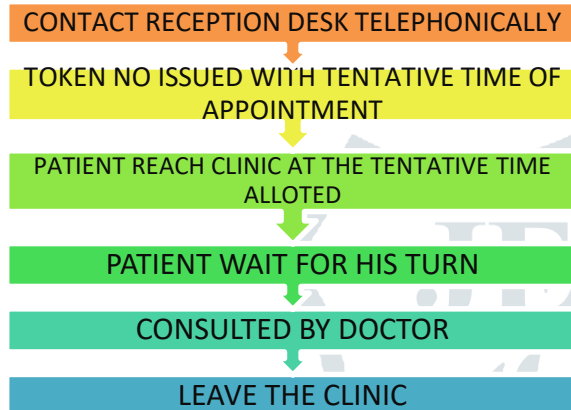    CONSULTED BY DOCTOR

    LEAVE THE CLINIC

2.  **Telephonic Token Appointment (TTA):** In this era of mobile phone revolution, the telephonic appointment system has taken over the physical interactive appointment mode. Patient take appointment over the phone by calling the reception of the clinic and the reception staff attend the call and issue the

appointment token over the call with tentative appointment time. Patient than visit the clinic as per the allotted appointment schedule.

This appointment mode is now a days most common. The only limitation is the congestion in telephone line what a patient come across while booking the appointment. Also in case a patient miss his appointment it is presumed as 'No Show' and has to again take an appointment for his turn.

*Patient Flow Chart 2.*

*Flow of patient's movement at AHS from arrival to departure with conventional Telephone Token Appointment Mode .*

CONTACT RECEPTION DESK TELEPHONICALLY

TOKEN NO ISSUED WITH TENTATIVE TIME OF APPOINTMENT

PATIENT REACH CLINIC AT THE TENTATIVE TIME ALLOTED

PATIENT WAIT FOR HIS TURN

CONSULTED BY DOCTOR

LEAVE THE CLINIC

3. **Appointment Queue management System ( AQMS )** : Information and communication Technology had made life of human being simpler and convenient.AQMS is one of the ICT revolutionary e appointment solution which a patient could access online or through android application . It is based on queue mechanism . Patient who is willing to take appointment can access the appointment portal anywhere, any time  and book an appointment . On booking an appointment an token number is generated along with the tentative time of appointment and a live link to track the appointment status which make the patient feel de-stressed through live update on waiting period. This flexi appointment system also generate reminders SMS to the patient before arrival of their appointment turn thus create an ease for the patient .

Patient Flow Chart  3.

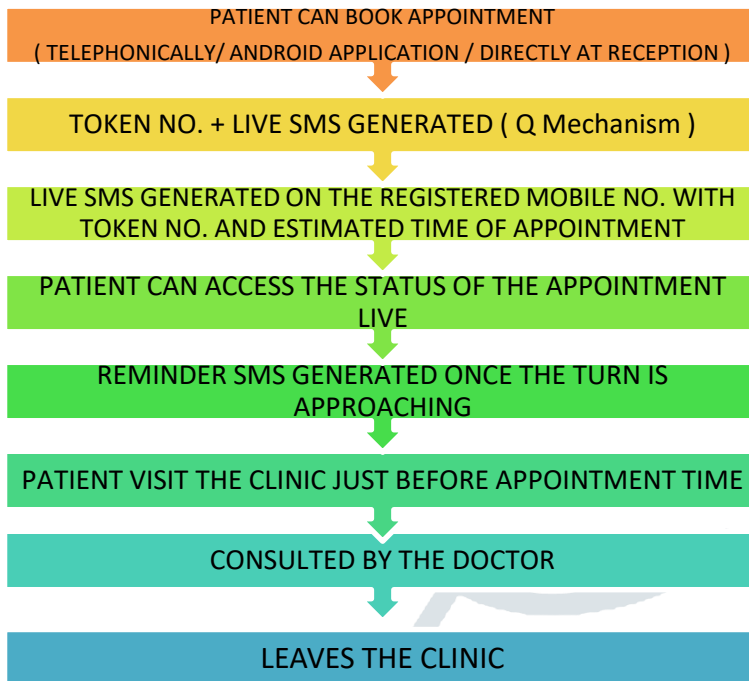Flow of patient's movement at AHS from arrival to departure after implementation of AQMS

PATIENT CAN BOOK APPOINTMENT
( TELEPHONICALLY/ ANDROID APPLICATION / DIRECTLY AT RECEPTION )

TOKEN NO. + LIVE SMS GENERATED ( Q Mechanism )

LIVE SMS GENERATED ON THE REGISTERED MOBILE NO. WITH
TOKEN NO. AND ESTIMATED TIME OF APPOINTMENT

PATIENT CAN ACCESS THE STATUS OF THE APPOINTMENT
LIVE

REMINDER SMS GENERATED ONCE THE TURN IS
APPROACHING

PATIENT VISIT THE CLINIC JUST BEFORE APPOINTMENT TIME

CONSULTED BY THE DOCTOR

LEAVES THE CLINIC

Table 1: Definition

| Definition | |
|---|---|
| Registration Time | The time consumed for getting the appointment and joining the queue. |
| Pre-consultation Waiting Time | The time taken after getting an appointment to being consulted by the doctor. |
| Consultation time | The time consumed from entering the consultation room to the end of the consultation by doctor. |
| Total Time | Total time consumed i.e. the time when the patient entered the clinic to the time he left the clinic. |

**Aims:**

The aim of the research studyis to evaluate the impact of appointment queue management system (AQMS) over the pre consultation waiting time and patient satisfaction level over the conventional First Come First Serve (FCFS) and Telephone Token Appointment system .

**Objective :**

To identify benefits of appointment queue management system (AQMS).
To suggest the changes based on the feedback of the patients  for further improvisation of the appointment system.

**Research Methodology : A** Cross Sectional Descriptive study

**Place Of study**:  Sample collection done at the waiting area / reception area of AroraHomoeo Specialties (AHS).

**Duration of Study:** One Month .Period Of Survey: 1 April 2019 to 31st April 2019

**Sampling Technique:** Random Sampling. Patients visiting AHS during the period of survey except those who

were critically ill .

**Sample Size :**Sample size for the study was 100 (Approx.). (95 % level of confidence expected and 5 % margin of error).

**Data Collection Tool:**Data collection is done through a structured questioner. Each mode of seeking appointment i.e.First Come First serve (FCFS) ,Telephonic Token appointment (TTA)  andAppointment Queue management system (AQMS) is fixed for 10 days each for collection of data over a month .

## Data analysis
The data collected is analyzed statistically through SPSS Version 21.

**MODE OF BOOKING APPOINTMENT**

**Case Processing Summary**

| | | Cases | | | | | |
|---|---|---|---|---|---|---|---|
| | | Valid | | Missing | | Total | |
| | MODE OF BOOKING APPOINTMENT | N | Percent | N | Percent | N | Percent |
| PRE CONSULTATION WAITING TIME | FIRST COME FIRST SERVE | 33 | 100.0% | 0 | 0.0% | 33 | 100.0% |
| | TELEPHONIC TOKEN APPOINTMENT | 31 | 100.0% | 0 | 0.0% | 31 | 100.0% |
| | APPOINTMENT QUEUE MANAGEMNT SYSYTEM | 36 | 100.0% | 0 | 0.0% | 36 | 100.0% |
| PATIENT SATISFACTION | FIRST COME FIRST SERVE | 33 | 100.0% | 0 | 0.0% | 33 | 100.0% |
| | TELEPHONIC TOKEN APPOINTMENT | 31 | 100.0% | 0 | 0.0% | 31 | 100.0% |
| | APPOINTMENT QUEUE MANAGEMNT SYSYTEM | 36 | 100.0% | 0 | 0.0% | 36 | 100.0% |
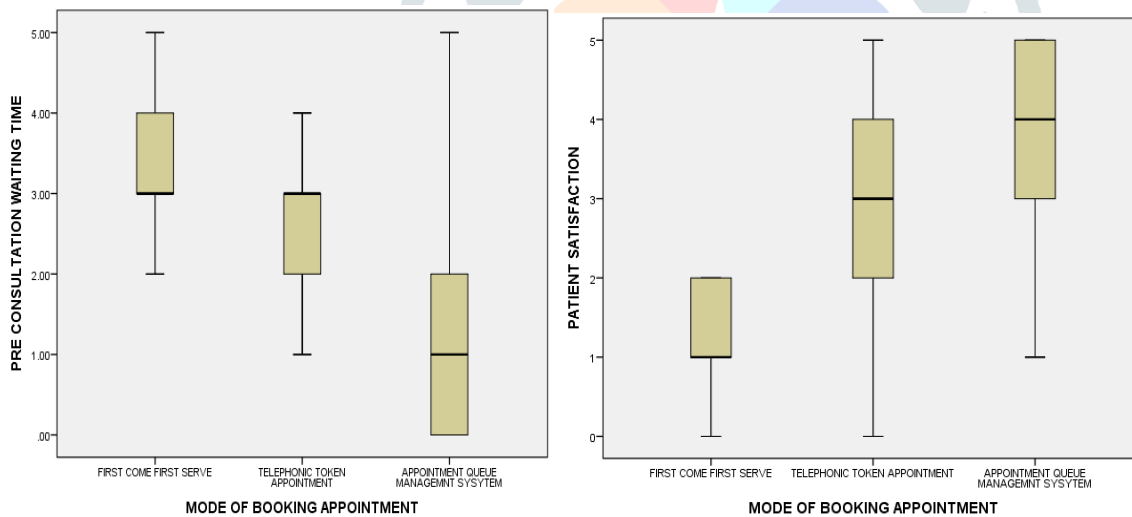


**ONEWAY ANOVA**

**Descriptives**

| | | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean Lower Bound | 95% Confidence Interval for Mean Upper Bound | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|---|
| PRE CONSULTATION WAITING TIME | FIRST COME FIRST SERVE | 33 | 3.4545 | .79415 | .13824 | 3.1730 | 3.7361 | 2.00 | 5.00 |
| | TELEPHONIC TOKEN APPOINTMENT | 31 | 2.5806 | .76482 | .13737 | 2.3001 | 2.8612 | 1.00 | 4.00 |
| | APPOINTMENT QUEUE MANAGEMNT SYSYTEM | 36 | 1.2222 | 1.09834 | .18306 | .8506 | 1.5938 | .00 | 5.00 |
| | Total | 100 | 2.3800 | 1.30097 | .13010 | 2.1219 | 2.6381 | .00 | 5.00 |
| PATIENT SATISFACTION | FIRST COME FIRST SERVE | 33 | 1.18 | .769 | .134 | .91 | 1.45 | 0 | 2 |
| | TELEPHONIC TOKEN APPOINTMENT | 31 | 2.84 | 1.157 | .208 | 2.41 | 3.26 | 0 | 5 |
| | APPOINTMENT QUEUE MANAGEMNT SYSYTEM | 36 | 3.86 | 1.073 | .179 | 3.50 | 4.22 | 1 | 5 |
| | Total | 100 | 2.66 | 1.506 | .151 | 2.36 | 2.96 | 0 | 5 |

**ANOVA**

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| PRE CONSULTATION WAITING TIME | Between Groups | 87.608 | 2 | 43.804 | 53.144 | .000 |
| | Within Groups | 79.952 | 97 | .824 | | |
| | Total | 167.560 | 99 | | | |
| PATIENT SATISFACTION | Between Groups | 125.032 | 2 | 62.516 | 61.001 | .000 |
| | Within Groups | 99.408 | 97 | 1.025 | | |
| | Total | 224.440 | 99 | | | |

**Post Hoc Tests**

**Multiple Comparisons**

Tukey HSD

| Dependent Variable | (I) MODE OF BOOKING APPOINTMENT | (J) MODE OF BOOKING APPOINTMENT | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|---|
| PRE CONSULTATION WAITING TIME | FIRST COME FIRST SERVE | TELEPHONIC TOKEN APPOINTMENT | .87390* | .22708 | .001 | .3334 | 1.4144 |
| | | APPOINTMENT QUEUE MANAGEMNT SYSYTEM | 2.23232* | .21880 | .000 | 1.7115 | 2.7531 |
| | TELEPHONIC TOKEN APPOINTMENT | FIRST COME FIRST SERVE | -.87390* | .22708 | .001 | -1.4144 | -.3334 |
| | | APPOINTMENT QUEUE MANAGEMNT SYSYTEM | 1.35842* | .22245 | .000 | .8289 | 1.8879 |
| | APPOINTMENT QUEUE MANAGEMNT SYSYTEM | FIRST COME FIRST SERVE | -2.23232* | .21880 | .000 | -2.7531 | -1.7115 |
| | | TELEPHONIC TOKEN APPOINTMENT | -1.35842* | .22245 | .000 | -1.8879 | -.8289 |
| PATIENT SATISFACTION | FIRST COME FIRST SERVE | TELEPHONIC TOKEN APPOINTMENT | -1.657* | .253 | .000 | -2.26 | -1.05 |
| | | APPOINTMENT QUEUE MANAGEMNT SYSYTEM | -2.679* | .244 | .000 | -3.26 | -2.10 |
| | TELEPHONIC TOKEN APPOINTMENT | FIRST COME FIRST SERVE | 1.657* | .253 | .000 | 1.05 | 2.26 |
| | | APPOINTMENT QUEUE MANAGEMNT SYSYTEM | -1.022* | .248 | .000 | -1.61 | -.43 |
| | APPOINTMENT QUEUE MANAGEMNT SYSYTEM | FIRST COME FIRST SERVE | 2.679* | .244 | .000 | 2.10 | 3.26 |
| | | TELEPHONIC TOKEN APPOINTMENT | 1.022* | .248 | .000 | .43 | 1.61 |

*. The mean difference is significant at the 0.05 level.

**Means Plots**
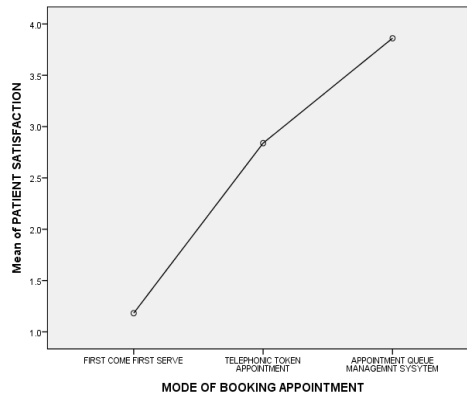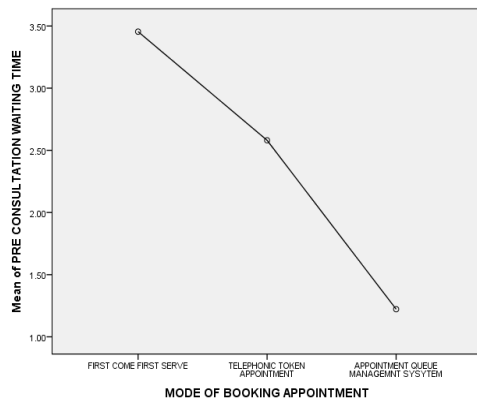




## Conclusion and Discussion

We conclude that the mean Pre consultation waiting Time is significantly different for at least one of the appointment mode groups ($F_{2,\,97} = 53.144$, $p < 0.001$). Also the mean Patient satisfaction is significantly different for at least one of the appointment mode groups ($F_{2,\,97} = 61.001$, $p < 0.001$).

It is concluded that patient who had used Appointment Queue Mangement system (AQMS) had higher rate of satisfactionsince they had to wait less and there Pre consultation Waiting Time is lesser than the other mode of appointment .

**Benefits Of AQMS :**

- A nature friendly appointment system . Helps to go paperless .
- Convenient access for patients who otherwise have to wait long for reception staff to service their call .
- Empowered patients to manage their appointment scheduling directly, 24/7, 365 days a year.
- Eliminate long Queues, allows the patient to get consulted quickly without standing in queue.
- Provides alalytics for patient appointment booking and generates reports for that.
- Improve staff productivity by leaving time for staff to focus on its work spread evenly over time except only for scheduling appointment and manage queue.
- Giving live update on waiting time it manages customer expectation and reduce frustration thus reducing Patient complaint. Patients can recievesrealtime notifications for their order number.
- Reduce No- Show – By pushing the patient back in queue and timely updates reduces no-show in case of delays .
- Continuous improvement , waiting period improves over period of time thus business become more efficient .

**Limitation :**

1. Its performance is dependent on the internet connectivity.
2. Aged patient found it difficult to handle.

**Acknowledgement**

**Bibliography :**

Cao, W., Wan, Y., Tu, H., Shang, F., Liu, D., Tan, Z., …Xu, Y. (2011). A web-based appointment system to reduce waiting for outpatients: A retrospective study.*BMC Health Services Research*, *11*(1), 318. https://doi.org/10.1186/1472-6963-11-318

Chaudhari, A. P. N. V, Phadnis, A., Dhomane, P., Nimje, J., & Sharma, A. (2017). Android Application for Healthcare Appointment Booking System, (3), 1196–1198.

Dai, X. (2013).Online Clinic Appointment Scheduling.*Lehigh Preserve*, 4.

Dinh Tran, T., Van Nguyen, U., Minh Nong, V., &Xuan Tran, B. (2017). Open Peer Review Discuss this article (0) Comments Patient waiting time in the outpatient clinic at a central surgical hospital of Vietnam: Implications for resource allocation [version 3; referees: 2 approved], (0), 1–8. https://doi.org/10.12688/f1000research.11045.1

Djirikian, D., Minasyan, H., &Demirchyan, A. (2003). An Evaluation of Patient Waiting Times in the Adult Cardiology Clinic of the NorkMarash Medical Center, (December), 1–32.

GUNELLA, P. (1952). Prime impressionisull'usodell'idrazidedell'acidoisonicotiniconegliaffetti da t.b.c. polmonaredegentinelSanatorioRasori. *Giornale Di ClinicaMedica*, *33*(5), 463–479.

Harrison, A. T. (1987). Appointment systems: Feasibility study of a new approach.*British Medical Journal (Clinical Research Ed.)*, *294*(6585), 1465–1466. https://doi.org/10.1136/bmj.294.6585.1465

Helbig, M., Helbig, S., Kahla-Witzsch, H. A., & May, A. (2009).Quality management: Reduction of waiting time and efficiency enhancement in an ENT-university outpatients' department.*BMC Health Services Research*, *9*, 1–9. https://doi.org/10.1186/1472-6963-9-21

Hirvonen, J. (2007). *Effect of Waiting Time on Health Outcomes and Service Utilization*. Retrieved from https://helda.helsinki.fi/bitstream/handle/10138/20348/effectof.pdf?sequence=2

Kalyango, J. N., Hall, M., &Karamagi, C. (2014). Appointment keeping for medical review among patients with selected chronic diseases in an urban area of Uganda. *Pan African Medical Journal*, *19*, 229. https://doi.org/10.11604/pamj.2014.19.229.3971

Kwena, Z. A., Njoroge, B., Oyaro, P., Cohen, C. R., &Bukusi, E. A. (2014). The Feasibility and Economic Impact of Time Designated Appointment System in a Busy HIV Care Clinic, *22*((Kwena, Oyaro) Center for Microbiology Research, Kenya Medical Research Institute, Kisumu, Kenya), 559. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed12&NEWS=N&AN=75008514

McMullen, M., &Netland, P. A. (2013). Wait time as a driver of overall patient satisfaction in an ophthalmology clinic. *Clinical Ophthalmology*, *7*, 1655–1660. https://doi.org/10.2147/OPTH.S49382

MeenaKumari, M., Somu, K., Amberkar, M., &Nandit, P. B. (2012). Patients' response to waiting time in an out-patient pharmacy at a tertiary care hospital. *Journal of Applied Pharmaceutical Science*, *2*(10), 090–093. https://doi.org/10.7324/JAPS.2012.21018

Rutledge, P. (1977). Reviewing an appointment system.*Journal of the Royal College of General Practitioners*, *27*(176), 167–168.

S, N., &Sarda, E. (2014).Online Appointment Scheduling System for Hospitals – An Analytical Study.*International Journal of Innovations in Engineering and Technology*, *4*(1), 21–27.

Sampson, F., Pickin, M., O'Cathain, A., Goodall, S., & Salisbury, C. (2008).Impact of same-day appointments on patients satisfactions with general practice appointment systems. *British Journal of General Practice*, *58*(554), 641–643. https://doi.org/10.3399/bjgp08X330780

Sundresh, J., Kouser, N., & K, N. S. (2016).MONITORING AND ANALYSIS OF WAITING TIME IN THE OUT, *5*(12), 921–928. https://doi.org/10.20959/wjpr201612-7465

Turkcan, A., Toscos, T., &Doebbeling, B. N. (2014).Patient-centered appointment scheduling using agent-based simulation.*AMIA ... Annual Symposium Proceedings / AMIA Symposium. AMIA Symposium*, *2014*, 1125–1133.

Yadav, R., & Phil, M. (2017).Reducing Waiting Time of Patients in Outpatient Services of Large Teaching Hospital: A Systematic Quality Approach.*IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN*, *16*(11), 1-07. https://doi.org/10.9790/0853-1611030107

Zhu, Z. C., Heng, B. H., &Teow, K. L. (2009).Simulation study of the optimal appointment number for outpatient clinics.*International Journal of Simulation Modelling*, 8(3), 156–165. https://doi.org/10.2507/IJSIMM08(3)3.132