Application of the Cycle Management Model in Improving Outpatient Appointment Services

Jiangxia Zhao¹, Xiaoqing Liu¹, Guiguo Gu¹, Huajun Gu¹, Yuzhong Yan¹ and Ming Li¹

Abstract
To explore the application of plan-do-check-action (PDCA) cycle management model in the management outpatient appointment, and improve the efficiency of outpatient appointment services. The data of outpatients from January 2019 to December 2020 were collected from a tertiary class B general hospital affiliated to a university in Shanghai. Through the investigation and analysis of the current situation, the reasons were found for the low rate of outpatient appointment. PDCA management was carried out, and measures were formulated for continuous improvement and the effective measures were standardized. The appointment rate, recognition rate and the utilization rate of self-service appointment (handheld hospital and self-service machine) were analysed after the intervention of PDCA. Through PDCA cycle management model, the appointment rate of outpatients increased from 9.93% before improvement to 82.50% after improvement, and the recognition rate of patients increased from 51.39% to 92.76%. The utilization rate of self-service appointment increased from 1.03% to 56.38%. Through the construction of multi-channel, wide coverage and convenient operation of the appointment service system, the PDCA cycle management model effectively improves the efficiency of the outpatient appointment services.

Keywords
plan-do-check-action cycle, outpatient, clinical reservation

Highlights
1. Question: What do we already know about this topic?
   The relevant departments of health in China require hospitals to improve the appointment rate of outpatient service. At present, related data are not good enough.

2. Question: How does your research contribute to the field?
   We will share the experience of PDCA cycle theory in improving outpatient appointment rate.

3. Question: What are your research’s implications towards theory, practice or policy?
   PDCA cycle theory can be applied to solve many problems in hospital health management.
Introduction

When the new health care reform began, the former Chinese Ministry of Health issued a series of documents requiring public hospitals to generally carry out appointment services. The documents also proposed to further facilitate and guide the public to make appointments for treatment by standardizing the appointment service platform, expanding the sources of outpatient registration and appointment-making, carrying out appointments in different periods and promoting appointments as a priority.1-3 At present, almost all tertiary hospitals in China have implemented outpatient appointment services. By the end of 2017, the average appointment rate of tertiary hospitals exceeded 50%, but there were still many problems in the actual implementation of appointment diagnosis and treatment, and the data were uneven, with great differences across hospitals.5-7

The plan-do-check-action (PDCA) cycle management model has been recognized by the public to solve the problem of work quality. In recent years, it has also been widely favoured by physicians at home and abroad,4 but no research has been found to apply the PDCA cycle management model in improving outpatient appointment services. Based on this, this study explored the formulation and implementation of a continuous improvement plan to enhance the efficiency of the outpatient treatment experience and appointment services using PDCA cycle management model.

Methods

Investigate the Current Situation (Plan)

Monthly reported data regarding outpatient services to registered patients, the number of outpatient appointments registered and the total number of outpatients registered were gathered before PDCA cycle management model was implemented in 2019, and after PDCA cycle management model was implemented in 2020, in a tertiary class B General Hospital in Pudong New Area of Shanghai, which is also a university affiliated hospital. The hospital has set up ways for making appointments on site, by telephone, in the clinic, by self-service machine and using the handheld hospital and Pudong health, public cloud and other public network platforms. However, through the analysis of the hospital appointment data, we found that the appointment rate was not ideal. The appointment rate of outpatient services was 18.22% in February 2020, which is far from the National Health Commission’s requested level and the standard for tertiary hospitals. Through further analysis of the methods patients used to make appointments, it was found that the main way was to make an appointment between clinics (62.35%), followed by on site and telephone in patient service centres (28.78%), hand-held hospital (2.59%), self-service machine (2.13%) and other public network platforms (4.15%).

The attitude and cognition of outpatients regarding appointments were investigated by questionnaire. Of the 541 respondents who completed the questionnaire, 263 were unwilling to make appointments, accounting for 48.61% Figure 1. According to the 80/20 rule, the causes to focus on for activity improvement include the low awareness rate of appointments, the difficulty of changing the habit of directly coming to the hospital and the low benefit of making an appointment, which together represent 80.99% of the respondents’ reasons for not making appointments.

Set the goal. Through comprehensive evaluation, combined with the background of hospital promotion, the goal is to increase the outpatient appointment rate of the hospital to more than 50% within half a year.

Causal analysis. Based on brainstorming targeting the problem of the low outpatient appointment rate and fish bone diagram analysis, the reasons for the low appointment awareness rate are shown in Figure 2, the reasons for the difficulty of changing habits are shown in Figure 3 and the reasons for the low benefits of making an appointment are shown in Figure 4.

Through real cause verification, the real causes are as follows: the management system is not perfect, the publicity training is insufficient, the appointment system is not perfect, there is no special guidance, the benefit is low, operation of the system is difficult for the elderly, the timing of available appointments is too far in advance, etc.
Formulation of countermeasures. According to the above reasons, we plan to improve the appointment rate by addressing the following five aspects: improve the appointment management system, strengthen hospital training, broaden the training and publicity channels, improve the appointment system and optimize the appointment process and add appointment volunteers to guide patients in making self-service appointments.

**Implementation Phase (Do)**

**Improving the appointment management system.** In the management system, the division of responsibilities of the relevant management departments was clarified; time-based appointments were implemented, with half an hour as the base time period; the number of appointments per department was set up separately; the acceptable time range of patients with appointments was clearly defined, with an accurate projection of the treatment time; and the registration time range of patients without appointments was clarified, such that on-site registration could only be carried out after 10:30 a.m. In the future, consideration of the number of appointments per department can effectively protect the benefits of patients with appointments, and the appointment rate index can be included for the department’s performance evaluation.

**Strengthening hospital training.** The importance of appointments, appointment methods, operational process, relevant work system, national requirements and other related contents were made into a PPT for medical staff. The appointment-related knowledge was included in the staff manual to encourage its mastery, and special training and operational guidance were carried out regarding the operational process of appointment to ensure that every doctor could operate the system.

**Broadening publicity channels.** The appointment method, process, advantages, expert information and other contents were integrated to make various forms of publicity materials, such as publicity boards, treatment guides, PPTs and rolling
announcements on the electronic screen in the outpatient hall. The appointment process was displayed on a board to provide the patients with easy access to publicity materials. The appointment process was issued through the official account of Palm hospital.

**Improving the reservation system.** A separate module of the appointment centre was embedded in the handheld hospital platform, divided into expert outpatients and general outpatients. The number of appointments per department was provided in half-hour increments to provide support for convenient handheld appointments. A new self-service appointment module was added to the self-service registration machine. A demonstration on the management of the appointment source and the construction of the appointment system was held to optimize the appointment system and ensure the use of preservice appointments. The functioning of the platform is stable.

**Adding appointment volunteers.** Appointments were made mainly by handheld hospital, by the self-service machine, at the clinic and on site. Two volunteers guided the patients to complete registration and carried out card binding and appointment operation through the handheld hospital platform to support the patients’ convenient use of this channel for making appointments in advance, increase patients’ acceptance and guide the patients with low acceptance of mobile phone operation to use the clinic card and conveniently make self-service appointments.

**Checks**

**Checking the implementation of the measures.** Whether the relevant management measures could be effectively implemented in reality and whether the reservation system operated normally were checked.

**Checking the key data.** Data regarding the outpatient appointment rate were collected and analysed before and after the implementation stage, as was information regarding the attitude and cognition of outpatients towards appointments and the use of each appointment channel. The differences before and after the improvement were compared, and the effect of the measures was evaluated. In the case of problems in the process of implementation or significant differences for the expected results, the original measures were further adjusted.

**Action**

The information platform should be fully used, taking the handheld hospital and self-service machine as the key ways for reserving appointments and guiding patients to use these methods and gradually develop the habit of self-service appointment. The situation of appointment-making and the use of major appointment platforms should be summarized and analysed every month for the continuous optimization of the appointment platform and process, incorporating effective measures into the system; learning. Promoting, summarizing and analysing the lessons of failure; and finally putting forward preventive and corrective measures for problems before entering the next PDCA cycle.

**Results**

After the countermeasures were taken, the outpatient appointment rate increased from 9.93% before improvement to 82.50% after improvement, reaching the expected improvement goal, as shown in Table 1. According to the results of the questionnaire survey, the recognition rate of appointments for treatment increased from 51.39% to 92.76%, as shown in Table 2. In terms of appointment channels, the proportion of appointments between clinics decreased from 62.80% to 3.35%. Two self-service channels, the handheld hospital and self-service machine, became the mainstream appointment channels, and the proportion increased from 1.03% to 56.38%, as shown in Table 3.
The PDCA cycle is a general management program that is widely used in hospital management. Through a series of measures, the hospital has established a relatively perfect appointment management system, constructed a multichannel and convenient appointment method with wide coverage, optimized the treatment process and made its management more scientific, effective and standardized.

In the process of improvement, the needs of elderly patients, who account for a large proportion of the patient population, must be considered. Elderly patients often have limited acceptance of new things, and it is difficult to change the long-term habit of direct registration and often have difficulties in using convenient appointment channels, such as the handheld hospital and self-service machine; it is also difficult for information-based propaganda to be effectively transmitted to this target population. Therefore, we regard these issues as an important focus for improvement. Among the improvement measures, along with improving the appointment system, volunteers offer guidance for elderly individuals to complete the self-service appointment operation and recognize the convenience of self-service appointment, greatly increasing their acceptance of the system. On the other hand, through the vigorous promotion of the independent appointment platform, the proportion of appointments between clinics decreased significantly, giving doctors more time to provide diagnosis and treatment services for patients.

After a period of operation, this system has greatly standardized the time patients spend at the hospital, reduces the waiting time, helps patients gradually develop the habit of making appointments and improves the patients' medical experience. By setting the number of appointments in different periods, patient appointments were effectively dispersed, which promotes the orderliness, rationality and effectiveness of patients' treatment, reduced the work pressure on outpatient doctors and played a positive role in the scientific and reasonable arrangement of outpatient medical resources in the hospital.

The main problem encountered in this study was that the elderly had a low response to the measures formulated. On the one hand, their habit of direct medical treatment over the years was difficult to change, and they usually had more spare time. On the other hand, they were less accepting of new things, and the convenient appointment methods such as self-service machines, WeChat official account and Internet. They often need to learn to use it smoothly. Therefore, family members were allowed to arrange appointments through our official account. And volunteers were set up near the self-service machine and booking centres, so as to guide patients to better master the appointment method and ensure the effective implementation. The hospital will further strengthen the management of outpatient appointments, improve various details in the appointment service, shorten the waiting time of patients and improve the patients' medical experience. To further promote the scientific management of outpatient appointment services, questionnaires will be regularly distributed to the relevant staff and patients to timely address problems in the appointment service and make continuous improvements.

### Table 1. Comparison of Improvement in the Outpatient Appointment Rate Before and After PDCA Cycle Management.

| Time | Registration Number | Appointment Number | Appointment Rate, % |
|------|---------------------|--------------------|---------------------|
| Before | 1,396,735 | 138,690 | 9.93 |
| After | 964,484 | 795,659 | 82.50 |

### Table 2. Comparison of the Recognition Rate of Patients with Appointments.

| Time | Number of Questionnaires | Number of Approved Appointment Visits | Approval Rate, % |
|------|--------------------------|--------------------------------------|------------------|
| Before | 541 | 278 | 51.39 |
| After | 1008 | 935 | 92.76 |

### Table 3. Comparison of Appointment Ways.

| Time | Appointment Channel | Before Booking Volume | Proportion (%) | Before Percentage Change (%) | Before Appointment Volume Proportion (%) | After Booking Volume | Proportion (%) | After Percentage Change (%) | After Appointment Volume Proportion (%) |
|------|---------------------|-----------------------|----------------|-------------------------------|----------------------------------------|---------------------|----------------|-------------------------------|----------------------------------------|
| Clinic appointment | 87 095 | 62.80 | -59.45 | 26 624 | 3.35 | 310 278 | 39.00 | 10.48 | 143 001 | 17.97 | 37.74 |
| Service centre appointment | 39 556 | 28.52 | -6.38 | 305 646 | 38.41 | 10 110 | 1.27 | -6.38 | 10 610 | 7.65 | 12.27 |
| Self-service appointment | 489 | .35 | -17.62 | 10 110 | 1.27 | 10 110 | 1.27 | -6.38 | 10 610 | 7.65 | 12.27 |
| Palm hospital | 940 | .68 | -37.74 | 10 110 | 1.27 | 10 110 | 1.27 | -6.38 | 10 610 | 7.65 | 12.27 |
| Other public network platforms | 10 610 | 7.65 | -37.74 | 10 110 | 1.27 | 10 110 | 1.27 | -6.38 | 10 610 | 7.65 | 12.27 |
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ORCID iD
Yuzhong Yan  https://orcid.org/0000-0002-9537-8377

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