



# Study on the Effect of Lean Management in Optimizing Nucleic Acid Testing Process in Outpatient Department

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**Abstract:** Objective — To explore the application effect of lean management in optimizing nucleic acid testing process in outpatient department. Methods — A lean management team was established, and the statistics were observed on the spot. The key problems were identified by drawing fish-bone map through the flow chart of nucleic acid test of patients and the time required for each node. The lean management method was adopted to optimize and continuously improve the process. The length of waiting time of nucleic acid test patients before and after the implementation of lean management was compared, and the satisfaction questionnaire was used to analyze the difference between the reference group and the observation group. Results — After the implementation of lean management, the waiting time for nucleic acid test was reduced from 45.50 minutes to 22.36 minutes, and patient satisfaction was improved from 88.6% to 92%. Conclusions — Lean management can not only shorten the time for patients to see a doctor, improve the speed of nucleic acid testing, and patients can be effectively distributed to minimize the risk of cross-infection, improve patients' medical experience, and improve patient satisfaction.

**Keywords:** lean management, nucleic acid testing, waiting time

Lean management originates from lean production, which is to create as much value as possible with the minimum investment of resources (including manpower, equipment, capital, materials, time and space), provide customers with high-quality products and timely services, and improve satisfaction. On the basis of continuous improvement and people-oriented, lean medical service e three basic principles were established based on lean medical services: care for patients, value and satisfaction improvement[1].

At present, China's prevention and control of the pandemic has been in the stage of normalized management, and all regions of the country are constantly improving nucleic acid testing capacity, optimizing testing procedures, and making all-out efforts to achieve normal epidemic prevention and control. In order to fulfill the requirement of "all tests should be carried out", the demand for novel coronavirus nucleic acid testing (Hereinafter referred to as nucleic acid testing) also witnessed significant increase. A confirmed case of Novel Coronavirus pneumonia was reported in our city on January 14, resulting in a surge of nucleic acid testing personnel in our hospital, and the waiting time for diagnosis was up to 3 hours, resulting in a decrease in patient satisfaction. In order to improve the efficiency of nucleic acid testing and shorten the waiting time of patients, lean management was adopted in the outpatient department of our hospital for the continuous improvement of nucleic acid testing process after lean management training, and the application of lean management in optimizing the nucleic acid testing process of outpatients was studied, so as to achieve good results[2].

## 1. Data and methods

### 1.1 General information

Through backstage based big data collection, 20 outpatients were randomly selected for waiting time of nucleic acid testing (registration, billing, payment, sampling) before and after the Lean project (January 16, 2021), and the data before and after lean management were statistically analyzed.

### 1.2 Lean project based implementation methods

A lean management team was established to conduct a status survey and create a value flow chart of nucleic acid testing in outpatient clinics (Figure 1). The working time, delay time and total time required for registration, billing, payment and sampling in nucleic acid testing of 20 outpatients were observed and counted on site (Table 1).

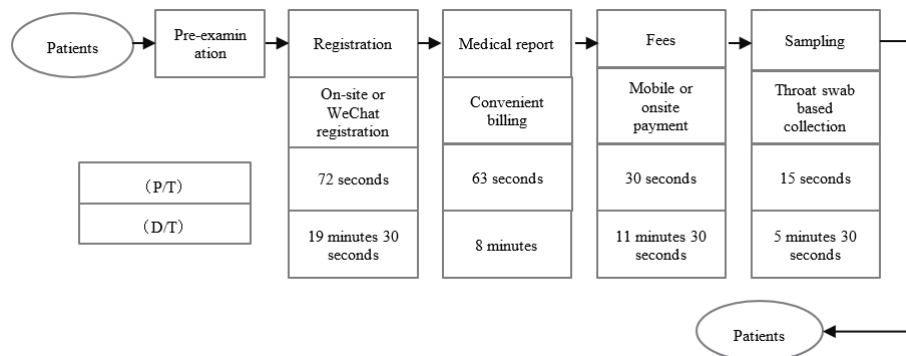


Figure 1. Flow chart of waiting value of nucleic acid test patients

Table 1. Waiting schedule of nucleic acid test patients before and after the activity

| Time                 | The mean length of nucleic acid test in 20 outpatients was randomly selected |                       | Comparison |
|----------------------|--|-----------------------|------------|
|                      | Before activity  | After activity        |            |
| Operation time (P/T) | 3 minutes  | 3 minutes             | -          |
| Delay time (D/T)     | 42 minutes 50 seconds  | 19 minutes 36 seconds | 54.24%     |
| Total length (L/T)   | 45 minutes 50 seconds  | 22 minutes 36 seconds | 50.69%     |

### 1.2.1 Status survey

① Lean team members called up the number of nucleic acid test patients in our hospital from January 1 to January 16 from the hospital information system. It showed that there were 199 people who underwent nucleic acid test, and it took 1 hour for each person to complete nucleic acid test on average. The nucleic acid test process was not familiar with, and the diagnosis was slow. ② From January to March 2021, the satisfaction of outpatients was 86%, lower than the target of 90% of our hospital.

### 1.2.2 Goal setting

① Shorten the time node of each link of nucleic acid detection process, and control the time within 30Min; ② The satisfaction of patients increased to more than 90% according to the satisfaction survey requirements of national public hospitals in our hospital.

### 1.2.3 Reasons and data analysis

① Lean team members can understand the time required for each link of nucleic acid testing on site, and make targeted rectification for the link with the maximum required time, so as to shorten the time for patients. Collect lean team members and consult patients' opinions on the spot, and draw fishbone diagrams by brainstorming. (Figure 1)

② The reasons affecting the waiting time of nucleic acid test are discussed and analyzed, and the main reason is the long time required for registration (no medical card), billing (no smart phone binding medical card) and payment (no mobile phone payment function) in nucleic acid test.

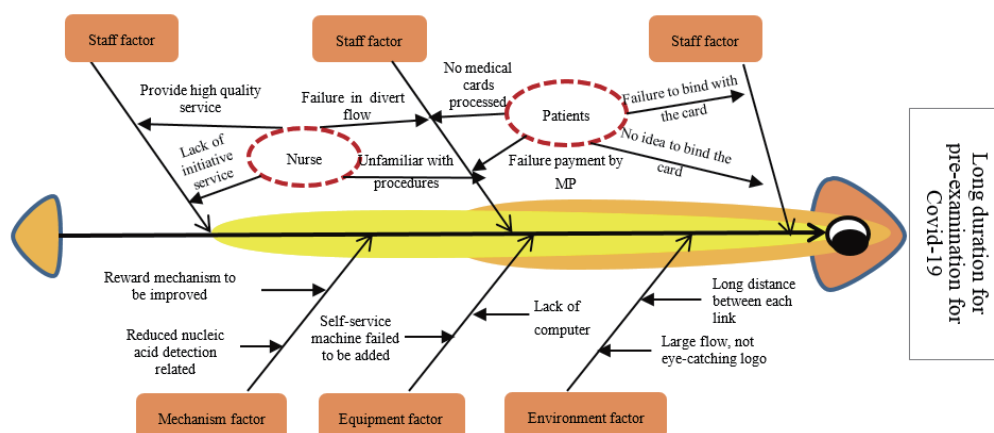


Figure 2. Analysis of reasons for long waiting time of nucleic acid test patients in outpatients

### 1.2.4 Improvement actions

The specific contents are as follows: ① Set up "nucleic acid testing convenient billing point" at the gate of the hospital, move the convenience terminal forward, implement "one-stop" service for registration, billing, payment and nucleic acid sampling, and reduce the time waste caused by repeated queuing [3]; (2) To avoid some patients because of unable to provide medical card number or can't bind WeChat public and need to enter the hospital, increase the self-service machine, only need id card can the self-service machine is dealt with in attendance card, and can also be registered, pay cost, check the result, take out again into the hospital for medical card number of redundant link, the optimization process, shorten the waiting time [4]; ③ "Venues for convenient test of nucleic acid" and "venues for nucleic acid test sample" can be completed outside the hospital, to reduce the inconvenience of patients up and down the stairs, thus reducing the gathering of personnel and minimizing the risk of cross infection. ④ With the online smart hospital self-service registration, billing and payment functions, you can complete the operations at home. When you come to the hospital, you can directly go to the sampling point for nucleic acid testing, which greatly reduces the waiting time of patients.

### 1.3 Evaluation indicators

① Patients' waiting time for registration, billing, payment and nucleic acid sampling were recorded, and various indicators were compared between groups; ② The satisfaction questionnaire made by the department was used to investigate and compare the satisfaction of the two groups of citizens with the nucleic acid testing process before and after the lean project[5].

### 1.4 Statistical analysis

Excel 2013 was used to establish the database, and statistical software SPSS20.0 was used to process the data. The comparison of basic information between groups was expressed as library ( $X \pm S$ ) and was tested by  $t$ ; the comparison of clinical effects between groups was tested by  $\chi^2$ .  $P < 0.05$  means the difference is statistically significant.

Table 2. Comparison of waiting time of nucleic acid test between groups before and after implementation (min,  $X \pm S$ )

| Groups            | n   | Registry   | Billing    | Fees      | Sampling  |
|-------------------|-----|------------|------------|-----------|-----------|
| Reference group   | 199 | 15.86+3.18 | 29.76+4.28 | 9.87+2.94 | 6.57+2.34 |
| Observation group | 199 | 7.94+2.59  | 15.06+3.89 | 6.34+2.16 | 3.46+1.97 |
| T value           |     | 27.242     | 35.854     | 13.65     | 14.343    |
| P value           |     | <0.05      | <0.05      | <0.05     | <0.05     |

## 2. Results

### 2.1 Comparison of waiting time for nucleic acid test between groups

The time of registration, billing, payment and sampling in the observation group was shorter than that in the reference group, and the time difference of all observation indicators was statistically significant ( $P < 0.05$ ), as shown in Table 2.

### 2.2 The reduced pressure of onsite registration

The establishment of venues for nucleic acid testing, optimization of nucleic acid testing process, was widely recognized by the majority of citizens seeking medical treatment, and the use of self-service machine, mobile pre-examination triage group adopted to guide the use of self-service machine, and medical card can be utilized for quick processing to improve the rate of nucleic acid testing and payment and citizen satisfaction.

### 2.3 The waiting order of nucleic acid test area is more orderly

The nucleic acid testing process is optimized to make the service process more compact, bringing convenience and speed to patients. The crowding degree of nucleic acid diagnosis and treatment area in the outpatient clinic is greatly reduced, and the medical environment of citizens is improved[6]. Patient satisfaction is increased from 88.6% to 92% (Figure 3), improving patient satisfaction.

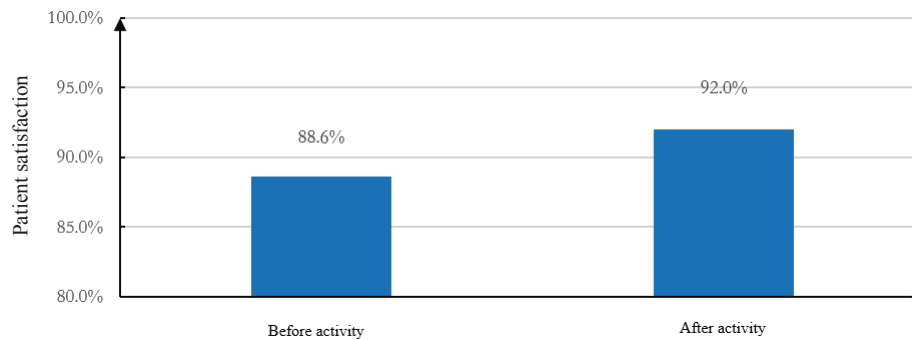


Figure 3. Comparison of patients' satisfaction with nucleic acid test before and after lean management

### 3. Discussion

As an important window of the hospital, the outpatient department has a large flow of people, and with the uncertainties of the epidemic, if the nucleic acid testing process is improperly designed or the workload is not balanced, it is bound to affect the waiting time of patients and increase the risk of personnel gathering during the epidemic[7]. Lean management is made to create as much value as possible with the minimum investment of resources, aiming at taking effective and reasonable measures to arrange medical treatment links scientifically and meet patients' expectations. Lean management was adopted as the scientific method, which was used for quick and easy solutions, and for optimization of outpatient nucleic acid testing process, so as to realize online booking, online payment, online check test report. Based on this, it can shorten the time, medical personnel can be effectively distributed to reduce unnecessary personnel distribution, as a result, to reduce the risk of cross infection to the greatest degree. It can make patients to take less unnecessary time without long time waiting, thus improving patients' nucleic acid testing experience and patients' satisfaction, which is worthy of promotion and application.

### References

- [1] Xu Yuqing, Mo Manli, Liang Jiezhen, Huang Lihua. Practice and effect of lean management to reduce waiting time of obstetrical outpatients[J]. *Guide of China Medicine*, 2020,18(21):284-286.
- [2] Xia Zhou, Fengjuan Liang, Jiayu Sun, Aiyun Shan. Application of Lean management in shortening waiting time of patients in TCM pharmacy in peak period[J]. *Modern Hospital*, 2020,20(01):60-63.
- [3] Xu Yan, Qiu Wuqi, Hou Xiaohui, Wang Kun, Yang Yue, Qiu Cuiping, Zhang Yu. Application of lean management in optimization of peripartum medical and nursing service quality[J]. *Chinese Journal of Women and Children Health*, 2021,12(01):63-67.
- [4] Zhang Yinjuan, Yang Hua, Chen Jue, Lu Xiaojuan Lean management of outpatient self-service[J]. *Hospital Administration Journal of Chinese People's Liberation Army*, 2018,25(12):1113-1115.
- [5] Deng Suhong, Zeng Lanjuan, Peng Peiling, Liu Yinghui, Dai Ningjun. The influence of lean management mode based on process transformation on the efficiency of outpatient wound management center and patient satisfaction[J]. *Nursing Practice & Research*, 2021,18(06):924-926.
- [6] Chen Yaqian. The relationship between setting mode and diagnosis and treatment process of fever outpatient clinic under COVID-19 and its effectiveness[J]. *Lingnan Journal of Emergency Medicine*, 2021,26(01):69-72.
- [7] Zhang Junhui. Optimization effect of lean management in outpatient process[J]. *Guide of China Medicine*, 2020,18(28):236-237.