Influence Factors of Patient No Show in a Outpatient Department

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Abstract. Facing increasing no show rate, no show influence factors are investigated in the paper. Real data has been collected from West China Hospital (WCH). According to collected data, 8 factors have been extracted as influence factors. Description statistic is used to analyze the relationship between above factors and no show rate. Then the paper adopts one-way ANOVA to analyze the importance of these factors. Finally, appointment lead time, channel, age and address have been proposed to have greater impact on patient no show. And some management insights are proposed.

1. Introduction

Limited resource, investment and uneven distribution are the major problems faced by healthcare industry in China for a long time. Especially in recent years, aging population and worsening environment have led to the rapid increase in healthcare demand. Imbalance between demand and supply has become more and more serious. Under this background, appointment system has been put into effect in most large public hospital in China. With the implementation of appointment system, many problems have also appeared, such as no show.

West China Hospital (WCH) has been taken as the research object in this paper. West China Hospital (WCH) located in Sichuan, China, a large public hospital in China and one of the largest single point of access hospitals in the world. There are more than 17,000 outpatients per day in WCH and it is a key healthcare provider in southwest in China. Through survey with WCH administrator, no show is regarded as a major problem in outpatient department and serious reduces the efficiency of appointment system. Although no show rate is around 5% in WCH, the outpatient base is large. There are hundreds of outpatients no show per day. Moreover, WCH is one of the best hospitals in China. High-quality healthcare resources are wasted if appointment patient is no show. More serious, the patient who is really in need of service by physician couldn’t make an appointment. Their condition may become worse even dead. So what influence factors impact on patient no show has been faced by WCH administrator. Using WCH real data which extracted from HIS (Healthcare Information System), the paper will adopt description statistic and one-way ANOVA method to analyze the influence factors of no show and propose what factors really impact on patient no show.

Influence factors of patient no show have been studied by many researchers. Sex is found an important influence by some studies. Sharp and Hamilton found sex, age, patient waiting time and family were the mainly influence factors [1]. Kruse and Rohland got a conclusion that no show rate was affected by patient sex [2]. Bean and Talage found male’s no show rate was lower than female [3]. Age and first/return visit are another factors. Deyo et al. found the patient was younger, the no show rate
was higher \cite{4}. Goldman found no show rate of aged was lower than other people \cite{5}. Tseng found no show rate of first visit was higher than return visit \cite{6}. Appointment lead-time and address are also studied by many researchers. Bean and Talaga formulated a forecasting no show rate model through appointment lead time, age and sex \cite{6}. Mcmullen and Netland found no show rate increased with lead time increasing \cite{8}. Liu et al. adopted sampling method to conduct a telephone surveys. The results showed that the residents had higher no show rate and mainly due to traffic disruption \cite{9}.

Through above literature review and combining collected real data, the paper selects appointment lead time, appointment channel, sex, age, address, first/return visit, service time period and physician level as the influence impactors to study.

2. Data Source
WCH’s Outpatient department was taken as an example to study the influence factor of patient no show. Data is from Hospital Information System (HIS), including 214108 data points from November 1, 2014 to November 30, 2014. Every data point includes “appointment state”, “appointment date”, “serve date”, “appointment channel”, “sex”, “age”, “address”, “first visit/return visit”, “service time period” and “physician level”.

Appointment state is whether patient show-up after she/he appointed successfully, including show up or no show. It is the dependent variable. The following influence factors are independent variables. Appointment lead time is the time difference between patient service date and appointment date. There are 8 appointment channels. To better dig up the influence factors, appointment channels have summarized into 5 types: phone call, DAS (Departmental appointment system), OAS (On-site appointment system), bank terminal and web-based online. Address is classified into 3 types: Chengdu City, Sichuan province (except Chengdu City) and other province. First visit is the newly patient who is the first time served by WCH. Return visit is the regular patient who visits WCH again according to physician advice. Service time period is the time slot of patient serviced by physician, including morning and afternoon. Physician level includes first-level specialist, secondary-level specialist, three-level specialist, four-level specialist, professor, associate professor and resident physician. For better research on these influence factors, independent variable, variable description and quantitative rule are summarized in table 1.

| Independent Variable (Influence Factors) | Variable Description | Quantitative Rule |
|-----------------------------------------|----------------------|-------------------|
| Appointment Lead Time                   | Time difference between the service date and appointment date | “0-10”=1;“11-20”=2;“21-30”=3;“31-60”=4;“61-90”=5;“91-120”=6 |
| Appointment Channel                     | Phone call, OAS, DAS, Bank terminal, Web-based online | “Phone Call”=1;“OAS”=2;“DAS”=3;“Web-based Online”=4;“Bank Terminal”=5 |
| Sex                                     | Female/Male          | “Female”=1;“Male”=2 |
| Age                                     | Patient actual age   | “0-10”=1;“11-20”=2;“21-30”=3;“31-60”=4;“61-90”=5;“91-120”=6;“Over 70”=8 |
| Address                                 | Chengdu Sichuan Providence (Except Chengdu) Other Providence | “Chengdu”=1;“Sichuan Providence”=2;“Other Providence”=3 |
| First visit/Return visit                | Newly patient; Regular patient | “First Visit”=1;“Return Visit”=2 |
| Service Time Period                     | Morning; Afternoon   | “Morning”=1;“Afternoon”=2 |
Physician Lever

- First-level, Secondary-level, Three-level, Four-level, Professor, Associate professor, Resident physician

“First-level” + “Professor” = 1;
“Secondary-level” + “Associate Professor” = 2;
“Three-level” = 3;
“Four-level” = 4;
“Resident Physician” = 5

The total number and ratio of show up and no show are shown in table 2.

|               | Number (person) | Ratio (%) |
|---------------|-----------------|-----------|
| Show Up       | 195792          | 94.76%    |
| No Show       | 11037           | 5.34%     |
| Total number  | 206829          | 100.00%   |

From table 2, the no show rate of WCH is 5.34%. Although the no show rate is not particularly high, the base of patient is huge. The number of no show is relatively high and run up to 367.9 persons per day. Influence factors of no show will be studied to provide some management insights to hospital administrator to control the no show patient better.

3. Data Analysis

For better studying influence factors of no show, descriptive statistics will be done firstly to excavate the relationship between these factors with patient no show. Then one-way ANOVA will be adopted to analyze above factors whether influence patient on show. Through above analyzing, some management insights will be proposed.

3.1. Descriptive Statistic

In this section, the relationship between influence factors (appointment lead time, appointment channel, sex, age, address, first/return, service time period, physician level) with patient no show will be analyzed. Results are shown in figure 1-figure 8.

From figure 1, the highest no show rate is 10.43% when lead time is during 51-60. The lowest no show rate is 4.70% when the lead time is during 0-10. When appointment lead time is too long, patient may go other hospitals for her/his condition is worsened. So no show rate increases with the increasing appointment lead time.

From figure 2, no show rate of bank terminal and OAS are lower and only 0.66% and 0.83% respectively. And no show rates of other 3 appointment channels are higher. Bank terminal and OAS requires patient prepaid when the appointed successfully. Other 3 appointment channels do not require patient prepaid. No show cost of bank terminal and OAS is higher than other channels. Their no show rate is low correspondingly.
From figure 3, the no show rates of male and female are almost the same. From figure 4, the no show rate of children and aged are lower than young and middle-aged.

From figure 5, no show rate of patient in Chengdu is much higher than other province. Patient in the Sichuan province is in the middle of them. From figure 5, no show rate of first visiting patient is lower than return visiting.

From figure 7, no show rates of different physician level are almost the same. From figure 8, no show rate of patient is serviced in afternoon is lower than morning.

3.2. One-way ANOVA
In this section, homogeneity of variance test will be done for all above influence factors to check whether these factors can be analyzed by one-way ANOVA. Result of homogeneity of variance test is
shown in table 3 and result of ANOVA is shown in table 4.

| Table 3 Homogeneity of Variance Test |
|--------------------------------------|
|                                       |
| Appointment Led Time                  |
| Levene Statistic: 827.12, df1:7, df2:158100, Sig.: 0.276 |
| Appointment Channel                  |
| Levene Statistic: 23490.212, df1:4, df2:158103, Sig.: 0.165 |
| Sex                                  |
| Levene Statistic: 347.79, df1:2, df2:158234, Sig.: 0.054 |
| Age                                  |
| Levene Statistic: 170.95, df1:7, df2:158100, Sig.: 0.122 |
| Address                              |
| Levene Statistic: 34.68, df1:2, df2:158105, Sig.: 0.087 |
| Frist /Return Visit                  |
| Levene Statistic: 457.56, df1:2, df2:158105, Sig.: 0.032 |
| Physician Level                      |
| Levene Statistic: 215.82, df1:8, df2:158099, Sig.: 0.087 |
| Service Time Period                  |
| Levene Statistic: 457.56, df1:2, df2:158105, Sig.: 0.065 |

In table 3, except Frist/Return visit, p values of all other factors are bigger than 0.05 and tested, i.e. p > 0.05. In other words, all other factors could be analyzed by ANOVA except Frist/Return visit.

| Table 4 One-way ANOVA Analyze |
|-------------------------------|
| Sum of Squares | df | Mean Square | F | Sig. |
| Appointment Lead Time | 205.268 | 7 | 29.324 | 226.599 | .000 |
| Appointment Channel | 1751.316 | 4 | 437.829 | 3659.918 | .000 |
| Sex | 2.134 | 1 | 2.134 | 16.329 | .007 |
| Age | 40.087 | 7 | 5.727 | 43.898 | .000 |
| Address | 2.307 | 2 | 1.153 | 8.825 | .000 |
| Physician Level | 58.134 | 8 | 7.267 | 55.752 | .010 |
| Service Time Period | 29.208 | 2 | 14.604 | 111.892 | .008 |

In table 4, p values of sex, physician and service time period are bigger than 0.001, i.e. p > 0.001. In other words, sex, physician and service time period have little impact on patient no show. And the p values of other factors are less than 0.001, i.e. p < 0.001. In other words, lead time, channel, age and address have greater impact on patient no show. Hospital administrator should pay more attention to these influence factors to reduce patient no show.

4. Discussions and Conclusion
In WCH, outpatient no show has serious impact on the efficiency of outpatient appointment system. How to reduce patient no show rate has become an urgent problem faced by hospital administrator. Data from HIS at WCH has been extracted to search for the no show influence factors. According to extracted data, the following factor, appointment lead time, appointment channel, sex, age, address, first/return, service time period, physician level have been proposed to study. Then Description statistic is used to analyze the relationship between these factors and no show. Finally, one-way ANOVA has been adopted to find the influence factor of no show.

Through above analyzing, appointment lead time, channel, age and address have greater impact on patient no show. Combining description statistic, when appointment lead time is longer, or un-prepaid, or young and middle aged, or in Chengdu, the no show rate is lower. For these above people, hospital administrator should implement a more stringent appointment policy.

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