

# Clinical Research

## Title

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“Daily Delays - Statistics on Health Quality Planning”

## Research Team

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## Keywords

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Time delays; health services quality; accessibility;

## Abstract

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**Introduction:** Ontime appointments are a quality standard in primary care, providing patient and professional satisfaction, less nuisance and a propitious mood to efficient communication, leading the appointment to meet its health providing goals. Daily constraints affect this standard, with lack of punctuality, lengthy appointments and carefree agenda planning, among the factors associated with delays.

We studied appointment times, to set a caliber for a statistic model, which by constant identification of relevant deviations from the goal, can ground options on medical agenda planning.

**Methods:** We conducted a retrospective study, with exploratory multivariate data analysis, of a random anonymized sample of medical appointments, from a week in the last trimester of 2018, in a family unit of ACeS Baixo Vouga. We verified appointment times (scheduled, activation and attendance), type and appointment initiative (doctor, nurse, patient or online), age and gender of the patients. Faults and blank schedule times were counted as negative extras and additional appointments as positive ones. Medical delay was set as the difference between first scheduled time and first attendance time. Patient delay was set as the difference between first scheduled time and its activation time. We created a logistic regression model to determine the probability of a given appointment to have more than ten minutes delay. The predictors selection process was accomplished using a stepwise (direction=both) analysis procedure that minimize the

information lost by the model (Akaike Information Criteria - AIC) in the automatic elimination of the studied sample of predictors, running the R\* 3.4.2 software in a Mac OS 10.14.

**Results:** We studied 562 appointments from doctors' one-week registrations, in a family health unit, in the center of Portugal. Most of the patients were female (63,7%), with a mean age of 49,1 years. The commonest appointment was adult health (63,2%), scheduled by patients' initiative (66,0%). We had 167 (29,7%) patients attended before the scheduled time, whilst 294 (52,3%) had more than a 10 minutes delay. Medical or nurse appointment initiatives concurred with more delays. There was a trimodal distribution of the delays, with the absolute mode at 10 o'clock. Doctors had an asymmetric incidence of delays, though not statistically relevant. Extra appointments aggravate the incidence of more than 10 minutes delay, whilst one negative extra approximates the proportion of delays and 2 negative extras inverts the relation, making delays less common. The odds ratio for more than 10 minutes delay per extra appointment is 1.37. After application of stepwise selection of models with different combination of predictors, we obtained a model with the following final predictors: scheduled time; activation time; patient initial delay; professional; appointment initiative. There were no significative differences between the model predicted results and the sample observations (*Hosmer-Lemeshow* test,  $X^2=8.066$ ;  $df=8$ ;  $p=0.427$ ). The predictive power of the model is considered excellent ( $AUC=0.828$ ,  $IC95\%=[0.793,0.864]$ ). According to this model, the odds ratio of a more than 10 minutes' delay, in a given appointment is:  $1/[1+\exp(-z)]$ , where  $z = 2.207 - 0.412*(\text{doctor appointment initiative}) - 0.842*(\text{patient appointment initiative}) - 0.681*(\text{online appointment initiative}) - 0.683*\text{scheduled time} + 0.739*\text{activation time} + 0.489*\text{number of extras} - 0.916*(\text{doctor M1}) - 1.700*(\text{doctor M2}) - 1.784*(\text{doctor M3}) - 1.977*(\text{doctor M4}) - 1.905*(\text{doctor M5}) - 0,005*(\text{doctor M6}) + 0.005*\text{initial patient delay}$ , and  $\exp(x)$  is the natural exponential function of  $x$ .

**Discussion:** The model is congruous with the observed reality, in which the odds of occurring a more than 10 minutes delay, increases with the activation time of the appointment. The paradoxical protective effect of the scheduled time, results of the current practice of attending patients ahead of the schedule time. Our results show a high incidence of delays above 10 minutes, in a primary care setting. Most of the delays occurred in medical or nurse programmed appointments, with proportionally less delays in adult health. Despite of the delays, we also had patients seen before time (30,5%), indicating that, when possible, doctors try to prevent them or to acquire extra time for

presumable more consuming appointments. It was expected that extra appointments aggravate the incidence of delays, however it is surprising that just one patient miss/blank schedule time reduces delays and that two events of that nature inverts the relation. Despite sensed opinions that doctors' first appointment delays are major contributors to cumulative delays across the day, we found the number of extra appointments and patient delays, to be the most preponderant ones. Doctors appear to have a potential preventive role against the existence of delays. Our model should be confirmed in other samplings, and corrective measures should be taken, to close the gap between the desired 0 delays cut-off, and the current results. We have an ongoing quality control project, cross matching models, namely an appointment faults' distribution model and applications of the waiting lists' theory, addressing both of these goals. By calculating the odds of delays, associated with specific predictors, maintaining the others constant, in different attending scenarios, our model helps local and national policymakers clarifying the impact of attendance rules and agenda management, in appointments' planning.

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