No-shows in appointment scheduling – a systematic literature review

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A R T I C L E   I N F O

A B S T R A C T

No-show appointments significantly impact the functioning of healthcare institutions, and much research has been performed to uncover and analyze the factors that influence no-show behavior. In spite of the growing body of literature on this issue, no synthesis of the state-of-the-art is presently available and no systematic literature review (SLR) exists that encompasses all medical specialties. This paper provides a SLR of no-shows in appointment scheduling in which the characteristics of existing studies are analyzed, results regarding which factors have a higher impact on missed appointment rates are synthetized, and comparisons with previous findings are performed. A total of 727 articles and review papers were retrieved from the Scopus database (which includes MEDLINE), 105 of which were selected for identification and analysis. The results indicate that the average no-show rate is of the order of 23%, being highest in the African continent (43.0%) and lowest in Oceania (13.2%). Our analysis also identified patient characteristics that were more frequently associated with no-show behavior: adults of younger age; lower socioeconomic status; place of residence is distant from the clinic; no private insurance. Furthermore, the most commonly reported significant determinants of no-show were high lead time and prior no-show history.

1. Introduction

No-show appointments (also commonly referred to as broken or missed appointments) are a burden to essentially all healthcare systems, significantly impacting revenue, cost and use of resources [1,2]. It is a well-known fact that no-show decreases the provider's productivity and efficiency, increases healthcare costs, and limits the health clinic's effective capacity [3,4]. Negative effects are also felt by patients who keep their appointments, such as dissatisfaction with high waiting time and perception of overall decrease in service quality [2,5,6]. In addition to creating financial costs for providers, non-attendance generates social costs related with unused staff time, ineffective use of equipment and possible misuse of patients' time [6].

There is a general consensus in literature regarding the fact that no-show does not occur arbitrarily and several studies have identified the need to statistically analyze the factors that influence its behavior in order to improve healthcare processes and dampen the effects of missed appointments. A number of the most recent of such studies attest to the existence of a relationship between no-show rates and patient behavior [4,7–10]. By evaluating this relationship through univariate and/or multivariate statistical methods, several works have proposed interventions to mitigate the negative effects of missed appointments [2,4], such as: overbooking [11–14], open access [15], appointment reminders [5], best management practices, among others.

There is a markedly growing interest from the healthcare community in uncovering and understanding the issues involved in no-show behavior. However, given the variability in context and specificities of health care delivery and systems, it is unlikely that a general agreement may be reached regarding the variables that statistically influence no-show behavior. Nevertheless, by aggregating studies that report on a range of different medical specialties and continents, and make use of distinct methodologies for data analysis, it is possible to identify the determinants that have been most frequently considered significant and their effect on no-show. Moreover, although a comprehensive synthesis of the state-of-the-art in this field would be of great value to researchers, practitioners, and hospital administrators alike, to the best of our knowledge, no updated systematic literature review (SLR) exists.

This paper addresses the aforementioned shortcomings by providing a SLR of no-show in appointment scheduling. The goals are

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Table 1
Query used for data collection.

	Keywords
(i)	no-show OR non-attendance OR missed appointment OR failed appointment OR fail* to attend
(ii)	appointments
(iii)	facto* OR variabl* OR determinan* OR reaso* OR characteristic* OR predic*
(iv)	(i) AND (ii) AND (iii)
(v)	only reviews/articles in English
(vi)	(iv) AND (v)

threefold: for one, we provide an overview of the characteristics of existing studies in terms of their methodology, continent where the study was undertaken, medical specialties involved, dependent variables considered, and values of no-show rates. In addition to that, we report on the most common tendencies across surveyed studies and detect patterns that emerge. Finally, we discuss our findings in light of previous literature reviews [16–18].

Of note, we adopt the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines [19] and organize the remainder of this paper as follows. In Section 2 we detail how data collection and study selection were performed, and report on the methods used for handling such data. Section 3 contains a complete account of the studies screened, assessed for eligibility, and included in this review, with reasons for exclusions at each stage, along with the results of our analysis. Finally, we summarize our main findings and present a general interpretation of the results with implications for future research in Section 4.

2. Methods

This work entails a SLR of existing studies on no-show in appointment scheduling. As such, we rely on qualitative, non-statistical tools for integrating, evaluating and interpreting results currently available in literature [20]. In what follows we describe our search strategy, recount eligibility criteria for study selection, and elaborate on our methodology for analyzing the surveyed studies.

2.1. Data collection

For data collection we used Scopus database [21], which is the largest online database of peer-reviewed literature, including MEDLINE, and performed a keyword-driven search strategy. The keywords were selected so as to yield a unified query for our systematic search, as shown in Table 1. In order to ensure that the results of our search would not be unduly constrained, synonyms for "no-show" were used as keywords (see item (i) in Table 1). Moreover; given that this review focuses on studies dealing with statistical analysis of determinants for no-show; synonyms for "determinants" were also added to the query (see item (iii) in Table 1). Our search spanned publications from 1980 until July of 2016 and comprised the fields "title"; "abstracts"; and "keywords" with no limitations with regards to the field "journals". Finally; it is worthwhile to mention that an advanced search was performed so as to retrieve different spelling occurrences of the keywords (e.g.; "no show" instead of "no-show") in both the singular and plural forms. We note that in the query; the asterisk (*) is used as a substitute for a variable number of characters.

2.2. Study selection

The first step in study selection was formulating eligibility criteria, which we defined in terms of desirable characteristics of the study. The list of criteria comprised the following items: (1) Study does not deal strictly with research in the medical field related to clinical treatment or diseases; (2) Study deals with no-show in the health sector; (3) No-show analysis is one of the study's research goals, and no-show is not merely cited as a problem or outcome; (4) Study does not deal exclusively with methods for intervention that improve no-show, including interventions with appointment reminders; (5) In the study, no-show is treated as a dependent variable, not as an explicative variable; (6) Study's research method is not based solely on descriptive statistics; study does not recount only self-reported or disease-related reasons for no-show; (7) Study does not deal with appointment making systems without analyzing factors that lead to no-show; (8) Study does not perform no-show analysis for other purposes (e.g., lean service, no-show with quality control, etc.). The studies whose abstract did not meet any number of the above criteria were excluded from further analysis.

The second step consisted of reading the studies that both passed the eligibility criteria and were available online, at which time we verified the need to define two additional constraints. The first such constraint (C1) had to do with the fact that some papers described no-show as an interruption in the patient's treatment, instead of as an appointment that had been scheduled and was not attended. The second constraint (C2) related to our assessment of the quality of the research documented in the paper, which we deemed to be poor in cases where statistical results were shown without any mention of the statistical test and/or model used, as well as in cases when a statistical technique was cited, but no results were presented.

As a final step, we manually screened the references of selected papers and were able to identify a small number of relevant studies that had not been previously retrieved, but nonetheless warranted consideration in our analysis.

2.3. Analysis of surveyed studies

The analysis of surveyed studies followed a stepwise approach that included pre-analysis, material exploration, and treatment, inference and interpretation of results [22]. Pre-analysis consisted of skimming the selected papers with the intent of identifying the general idea conveyed by each study. During this step, we identified relevant study components, from which the following units of analysis were selected: characteristics of the patient, appointment, clinic and provider; medical specialty analyzed in the study; continent where the study was performed; year when the study appeared; choice of statistical method and dependent variable; and reported value of no-show rate.

The second step, material exploration, entailed a structured exploration of the documents. Information on the units of analysis was collected and data were organized using a concept matrix. The last step of our analysis consisted of interpreting the results. The determinants of no-show that were more frequently considered significant were identified and their reported effects on no-show rates synthetized. In addition, average no-show rates were computed considering different continents, specialties, and publication dates.

3. Results and discussion

Our search using the Scopus database yielded a total of 727 papers, three of which were duplicates, so that 724 papers were screened for eligibility based on their title and/or abstract. The remaining 230 papers were screened based on their complete text using eligibility criteria as well as the additional constraints defined in Section 2.2. A total of 105 papers and three literature reviews on the subject of interest were retained. Although these review papers