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No-show after extracorporeal shock wave lithotripsy treatment in endourology clinic: Can we build a typical patient profile?

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Objectives: Patients "no-show" in outpatient clinics is a worldwide challenge. Healthcare providers and patients suffer from negative impacts that include increased expenditure, clinical management ineffectiveness, and decreased access to care. This study aims to evaluate no-show rate among extracorporeal shock wave lithotripsy patients visiting endourology clinic and to identify the demographic and clinical predictors of no-show.

Methods: A cross-sectional and historical cohort study using electronic medical records. We included 790 patients aged >18 years old referred for endourology clinic following shock wave lithotripsy during 2010–2017 at Hadassah Medical Center in Israel. We predicted no-show rate following shock wave lithotripsy by various patient characteristics by a multivariate logistic regression model.

Results: Overall, 291 (36.8%) patients did not arrive for postoperative clinic. Of these, 91 (11.52%) patients referred to Emergency Department. Patients who were younger in age (odds ratio 1.49, 95% confidence interval 1.08–2.04), patients who underwent hospitalization ≥3 days (odds ratio 1.63, 95% confidence interval 1.11–2.41) and patients who had undergone a stent-free shock wave lithotripsy (odds ratio 5.71, 95% confidence interval 2.40–13.57) were significantly associated with higher no-show rate. Larger stone size was associated with reduction in no-show rate with every millimeter increase of stone diameter was associated with a reduction of 6.1% probability for no-show (odds ratio 0.94, 95% confidence interval 0.89–0.99).

Conclusions: Predicting patients' characteristics and no-show patterns is necessary to improve clinical management efficiency, access to care, and costs. We showed that patients who were younger, patients who underwent stent-free shock wave lithotripsy, patients who had a smaller stone, and patients who underwent a longer hospitalization were more prone to miss their appointment. Paying attention to the characteristics of individual patients may assist in implementing intervening program of patient scheduling.

Key words: endourology, extracorporeal shock wave lithotripsy, no show, non-attendance, SWL.

Introduction

The healthcare giver-patient encounter is the cornerstone of medical treatment and follow up. Unfortunately, some patients do not attend scheduled appointment, a phenomenon called "no-show".[1,2] Patients "no-show" in outpatient clinics is a worldwide challenge, with a negative impacts that include clinical management ineffectiveness, decreased access to care, and a tremendous economic implication resulting in revenue shortfalls.[3,4]

Hence, predicting no-show patterns is important for improving the clinical management efficiency and accessibility of health-care delivery especially in outpatient clinics. Previous studies have reported an average rate of 23% no show with variation depending on the professionalism of medical disciplines.[5–8]

Several determinants impact 'no show' rate such as, logistical barriers, scheduling policy, transportation, communication and language barriers, timing of the appointment, and location. Patients' characteristics such as socioeconomic status, ethnicity, financial, insurance type, medical background, and anxiety, also affect patients' attendance. All these factor may provide a putative profile of the habitual no-show patient.[5,9–11] Nevertheless, currently, there is no single broadly agreed-upon tool that predicts nonattendance.

The objective of the study is to characterize the no-show patients' profile after ESWL for urinary tract stone disease SWL at a postoperative endourology clinic at Hadassah University Medical Center (Jerusalem, Israel). Since SWL has unique characteristics as compared to other surgical intervention as being a short procedure, no surgical incision made, urolithiasis often has an asymptomatic course, which might impact patients' adherence. Currently, we are unaware of any previous studies that have been done in this context.

Methods

The study is a cross-sectional and historical cohort study. Electronic medical records reviewed retrospectively regarding no-show rate following SWL. We examined the arrival rate at the clinic and referral patterns to the emergency room 180 days after the procedure was performed.

Data sources

Hadassah Hebrew University Medical Center is one of the largest hospitals located in Jerusalem, Israel. The widespread use of electronic medical records in this health fund enables access to visits data. We collected datasets that were linked by a unique national ID number, including in-admission, clinic, and Emergency Department patients' charts.

We also collected patient demographics and perioperative relevant determinants. All data were extracted by authorized personnel in the organization. The extracted data were anonymized by the removal of patient and physician identifying data. The study was approved by the Ethics and Research Committees of the organization. The data files were transferred to the researchers, who conducted rigorous data quality assurance, removing duplicates and outliers. We used a threshold of 3 days of hospitalization as a surrogate of prolonged or complicated periprocedural course. We used 40 years as a upper limit for classifying a patients as a young adult based on Rosenbaum and colleagues large scale study.[12]

Study population

The study population includes patients referred for endourology clinic at Hadassah Hebrew University Medical Center (Jerusalem, Israel), following SWL during 2010–2017. The inclusion criteria were as follows: (i) adult (>18 years old) patients; (ii) patients who underwent SWL for urolithiasis, with or without ureteral stent left; and (iii) referred for appointment during 180 postoperative period during 2010–2017. The exclusion criteria were as follows: (i) patients below 18 years old and (ii) patients who were planned for auxiliary procedure in advance.

Statistical analyses

Statistical analysis was conducted using IBM SPSS Statistics software version 23.0 (IBM Inc., Chicago, IL, USA). We produced descriptive statistics to generally describe patients' and perioperative characteristics. We checked correlation between the covariates. We compared the characteristics of patients who attended a scheduled appointment to those who did not, using univariate χ^2 tests.

In order to control confounding factors and published known factors impacting no-show,[13] we focused on patients with the same lead time between procedure and appointment referral 4–6 weeks postoperative; all were postoperative patients (e.g. returned patients, with the same clinical diagnosis); all patients referred for the same day of the week in a dedicated public clinic during standard working hours; and all had a public national healthcare insurance, and the procedure and clinic was covered by insurance. Our center has accessible and high-frequency public transportation lines, as well as ample parking, which eliminate transportation impact on attendance rate.

We used a multivariate logistic regression model for no-show prediction. We included in the multivariate model only those covariates that were significant ($P < 0.05$) in the univariate analyses. The threshold for elimination was 0.05.

Results

The entire sample included 790 SWL patients treated at Hadassah University Medical Center from October 2010 to July 2017. Most were male ($n = 587$, 74.3%); mean age was 48.22 (SD 13.84). The average dimension of stone treated was 8.93 mm (SD 3.12), and 68 (8.61%) patients had a ureteral stent left. The average admission length was 1.93 days (SD 2.11, range 1–33). Nine patients (1.14%) had an oral temperature ≥37.5°C, none had oral temperature above 38.

Baseline characteristics of the respondents are shown in Table 1. Overall, 291 (36.8%) patients did not arrive for postoperative clinic. Of these, 91 (11.52%) patients referred to Emergency Department. During study period, the rate of no-show ranged between 18.8% (2010) to 41.1% (2014) with no significant difference between years ($P = 0.397$).

Who are the no-show patients?

The covariates from the univariate analyses that were found to have a statistically significant effect ($P < 0.05$) on "no-show" included age, stone size, length of hospitalization, and ureteral stent left (Table 2).

No-show patients were younger than those who did attend (45.63 *vs* 49.73, $P < 0.001$) and no-show was more prevalent in younger adults (<40 years old) 36.08% *vs* 26.05% $P < 0.001$ ($\chi^2 = 8.849$, $P < 0.004$); no-shower also treated for smaller stones as compared to those who did attend (8.46 mm *vs* 9.21 mm, $P < 0.001$).

Hospitalization of 3 days and above was in 20.96% of no-shower and 14.83% among attended patients ($\chi^2 = 4.879$, $P = 0.004$). Lastly, 12.42% of no-showers underwent a stent-free SWL but only 2.06% of attended patients ($\chi^2 = 25.093$, $P < 0.001$).

There were no significant differences between the two groups, both genders and the prevalence of fever ≥37.5°C, hospitalization length as a continuous variable and ED referral pattern regarding rates and weekdays timing. Of note, No-show was more prevalent among males, though this was not statistically significant ($P = 0.109$).

Table 1 Patients' demographic and baseline characteristics (n = 790)

Characteristics	n (%)
Sex, n (%)	
Male	587 (74.30%)
Female	203 (25.70%)
Age, years, n (%)	
Mean (SD)	48.22 (13.84)
<40	555 (70.25%)
<40	235 (29.75%)
Stone size	
Mean (SD)	8.93 (3.12)
Arrival to clinic, n (%)	
Showed	499 (63.16%)
Did not show	291 (36.84%)
Fever in admission 37.5 or above, n (%)	
No	781 (98.86%)
Yes	9 (1.14%)
Length of hospitalization, n (%)	
Mean (SD)	1.93 (2.11)
<3 days	655 (82.91%)
≥3 days	135 (17.09%)
Ureteral stent left, n (%)	
No	722 (91.39%)
Yes	68 (8.61%)
Referred to ED during 180 days, n (%)	
Yes	91 (11.52%)
No	699 (88.48%)
Timing of ED referral (days), n (%)	
Mean (SD)	42.25 (46.72)
Working days	68 (0.09%)
Weekends	23 (2.91%)

Table 2 Univariate analysis attended *versus* no-show patients (n = 790)

Characteristics	Attended (n = 499)	No-show (n = 291)	Sig† (two-tailed)
Sex, n (%)			
Male	361 (72.34%)	227 (77.66%)	0.093
Female	138 (27.66%)	64 (22.34%)	
Age, years, n (%)			
<40	130 (26.05%)	105 (36.08%)	0.004
Stone size			
Mean (SD)	9.21 (3.30)	8.46 (2.72)	0.001
Fever in admission 37.5 or above			
n (%)	6 (1.2%)	3 (1.0%)	0.827
Length of hospitalization, n (%)			
≥3 days	74 (14.83%)	61 (20.96%)	0.033
Ureteral stent left			
n (%)	62 (12.42%)	6 (2.06%)	<0.001
Referred to ED during 180 days			
n (%)	52 (10.4%)	39 (13.4%)	0.219
Timing of ED referral			
Days, mean (SD)	41.03 (44.27)‡	43.07 (50.14)§	0.885
Weekends, n (%)	14 (26.42%)‡	9 (23.08%)§	0.68

†Independent sample *t* test for equality of means. ‡n = 52. §n = 39.

The significant covariates from the univariate analyses remained significant in the multivariate logistic regression (Fig. 1). More specifically, younger age (OR 1.49, 95% CI 1.08–2.04), hospitalization ≥3 days (OR 1.63, 95% CI 1.11–2.41), and a stent-free SWL (OR 5.71, 95% CI 2.40–13.57) were significantly associated with higher no-show rate. Stone size was inversely associated with no-show with every millimeter of stone diameter was associated with a reduction of 6.1% probability for no-show (OR 0.94, 95% CI 0.89–0.99).

The overall model was found to be significant (χ^2 = 47.64, df = 4, P < 0.001), with a goodness to fit of Cox & Snell R^2 = 0.06 and Nagelkerke R^2 = 0.08, which indicates a modest (6–8%) but significant contribution of the model to the prediction of no-show rate.

Discussion

Failure to attend scheduled clinic visit is a widespread challenge throughout the world and in various fields of medicine. Several studies have attempted to discuss this question, which remains open. As a result, the health care system suffers from a failure characterized by waste of resources: costs and manpower, inefficiency in timing resources, and impaired patient care. This study joins its predecessors, but uniquely focused on the endourology clinic following SWL.

Our results showed an overall no-show rate of 36.8%. Clinic non-show rates are higher than the average in the literature; several clinicopathologic features (young age, small stone, stentless SWL) were indeed found to be associated with higher no-show rates. When comparing our findings to previous studies, a non-arrival rate of 36.8% is somewhat high. Although studies reported a wide range of 3–80%, a rate of 23% is probably more representative.[5–8] Urology and subspecialty clinics' no-show rates were reported to be between 10.4–17.6%.[5,6,9,14,15] Nonarrival rate after SWL with its unique characteristics has yet to be examined. We assume that patients' perception regarding the procedure as a noninvasive and lack of postoperative symptom might underestimate the importance of follow up.

No show patients might be expected to be referred more frequently for treatment at Emergency Department. A poor follow-up and adherence could result in more complications, and misuse of medical services.[16,17] In fact, there was no higher rate of ED referral in this group, possibly due to a relatively low complication rate, overall.

Age is a well-known risk factor in several studies. Numerous studies show inverse correlation of no-show rate among adult population, e.g. that young adults are more prone to miss scheduled appointments has been summarized by Dantas *et al*. systematic review.[5] Our results are consistent with these studies. However, several other studies mentioned did not find age as a predicting factor (Table S1). Stone disease is prevalent among young patients (29.75% of our patients); therefore, these patients' high non-attendance rate should be addressed. We are not familiar with the study commenting on urolithiasis as a risk factor for nonattendance.

In conclusion, in this study, a prolonged hospitalization of 3 days or more, small stone, young age, and SWL without stents were found to be associated with a higher rate of "no show". In contrast, sex, fever, and emergency room referral patterns were not different between the two groups.
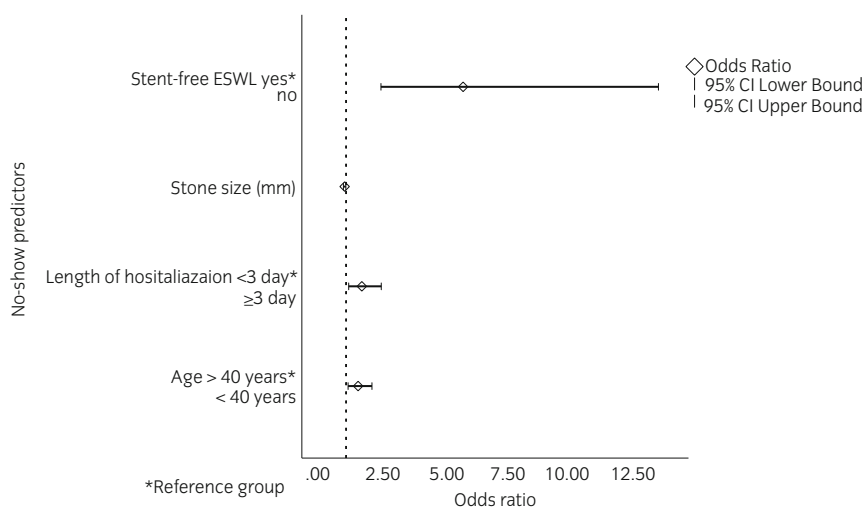
To our knowledge, our findings have not been examined in the literature as predictors of nonarrival rates. In this sense, our research is innovative and can deepen the understanding of these patients' profile. Prolonged perioperative hospitalization, in contrary to our assumption was associated with an increase in no-show rate rather than decrease. This could be reasoned by other factors as discrepancies between patient expectations and procedure outcomes, among others. We hypothesize that treating a smaller stone may cause patients to believe that the disease is of lesser importance and that follow-up may be impaired; although, the small difference in stone size between both groups may not have clinical significance. By contrast, leaving a ureteral stent increases the perceived value of the procedure, resulting in greater compliance. Another component of the stent is the considerable irritative side effects that may serve as a daily reminder of the stone disease and contributes to adherence to treatment and follow-up.

Limitations

Our study has limitations. Being a retrospective study rather than prospective, limits it strength. Moreover, we did not focus on several factors such as: prior no-show status, ethnicity, socioeconomic, and education levels, among others, which leave an opportunity for further research. Although our medical center is located in an urban area, and there is convenient access to public and private transportation, the distance from patients' residences and the required arrival time were not included in this study.

Also, data regarding the stone-free status and the location of the treated stone were not included, as well as data regarding the rate of hematoma following the procedure. Combining these data can reinforce the findings in this study. Moreover, the generalizability of our results might be limited by the population of patients following a specific procedure. We did not include a control group (e.g. following other urologic or nonurologic procedure, patients with various medical comorbidities), which might add some relevant information. Moreover, interviewing the no-show patients could provide further explanation why they did not attend follow up appointments. Nevertheless, the abovementioned determinants, with its equivalent in other disciplines (e.g. length of hospitalization following other procedures, percutaneous drainages instead of stent, minor operation in other fields), should be explored as a cofactor influencing no-show rate. Further well-designed research that will address these shortcomings could have an advantage regarding profiling no-show patients and generalizations of the findings.

This study used a retrospective analysis to estimate the typical no-show profile in postoperative SWL clinic. Predicting patients' characteristics and no-show patterns is necessary to improve clinical management efficiency, access to care, and costs.

We showed that patients who were younger, had underwent stent-free SWL, had a smaller stone, and had a longer hospitalization were more prone to miss their appointment. Paying attention to the characteristics of individual patients may assist in implementing intervening program of patient scheduling. Stakeholders could use these findings, among previous knowledge, and implement intervention programs to reduce no-show rate. More research is needed to establish the current findings and to expand our knowledge of the subject.

Author contributions

Conflict of interest

None declared.

Approval of the research protocol by an Institutional Reviewer Board

The research protocol was approved by the Institutional Reviewer Board, approval number: HMO 0492-18.

Informed consent

All patients' parents signed an informed consent before assigned to the study.

Registry and the Registration No. of the study/trial

N/A.

Animal studies

N/A.

References

1 Tuso PJ, Murtishaw K, Tadros W. The easy access program: a way to reduce patient no-show rate, decrease add-ons to primary care schedules, and improve patient satisfaction. *Perm J.* 1999; **3**: 68–71.

2 Davies M, Goffman R, May J *et al*. Large-scale no-show patterns and distributions for clinic operational research. *Healthcare* 2016; **4**: 15.

3 Moore CG, Wilson-Witherspoon P, Probst JC. Time and money: effects of no-shows at a family practice residency clinic. *Fam. Med.* 2001; **33**: 522–7.

4 Kheirkhah P, Feng Q, Travis LM, Tavakoli-Tabasi S, Sharafkhaneh A. Prevalence, predictors and economic consequences of no-shows. *BMC Health Serv. Res.* 2016; **16**. https://doi.org/10.1186/s12913-015-1243-z.

5 Dantas LF, Fleck JL, Cyrino Oliveira FL, Hamacher S. No-shows in appointment scheduling – a systematic literature review. *Health Policy* 2018; **122**: 412–21.

6 Ding X, Gellad ZF, Mather C *et al*. Designing risk prediction models for ambulatory no-shows across different specialties and clinics. *J. Am. Med. Inform. Assoc.* 2018; **25**: 924–30.

7 Parikh A, Gupta K, Wilson AC, Fields K, Cosgrove NM, Kostis JB. The effectiveness of outpatient appointment reminder systems in reducing no-show rates. *Am. J. Med.* 2010; **123**: 542–8.

8 Youssef A, Alharthi H, Khaldi OA, Alnaimi F, Alsubaie N, Alfariss N. Effectiveness of text message reminders on nonattendance of outpatient clinic appointments in three different specialties: a randomized controlled trial in a Saudi Hospital. *J. Taibah. Univ. Med. Sci.* 2014; **9**: 23–9.

9 Mohamed K, Mustafa A, Tahtamouni S, Taha E, Hassan R. A quality improvement project to reduce the 'no show' rate in a paediatric neurology clinic. *BMJ Open Qual.* 2016; **5**: u209266.w3789.

10 Mani J, Franklin L, Pall H. Impact of pre-procedure interventions on no-show rate in pediatric endoscopy. *Children* 2015; **2**: 89–97.

11 Frost L, Jenkins LS, Emmink B. Improving access to health care in a rural regional hospital in South Africa: why do patients miss their appointments? *Afr. J. Prim. Health Care Fam. Med.* 2017; **9**. https://doi.org/10.4102/phcfm.v9i1.1255

12 Rosenbaum JI, Mieloszyk RJ, Hall CS, Hippe DS, Gunn ML, Bhargava P. Understanding why patients no-show: observations of 2.9 million outpatient imaging visits over 16 years. *J. Am. Coll. Radiol.* 2018; **15**: 944–50.

13 Marbouh D, Khaleel I, Al Shanqiti K *et al*. Evaluating the impact of patient no-shows on service quality. *Risk Manag. Healthc. Policy* 2020; **4**: 509–17.

14 DuMontier C, Rindfleisch K, Pruszynski JE, Frey JJ. A multi-method intervention to reduce no-shows in an urban residency clinic. *Fam. Med.* 2013; **45**: 634–41.

15 Stubbs ND, Sanders S, Jones DB, Geraci SA, Stephenson PL. Methods to reduce outpatient non-attendance. *Am. J. Med. Sci.* 2012; **344**: 211–9.

16 Nguyen DL, Dejesus RS, Wieland ML. Missed appointments in resident continuity clinic: patient characteristics and health care outcomes. *J. Grad. Med. Educ.* 2011; **3**: 350–5.

17 Tang N, Stein J, Hsia RY, Maselli JH, Gonzales R. Trends and characteristics of us emergency department visits, 1997–2007. *JAMA* 2010; **304**: 664–70.

Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Table S1. Review of no-show rate and characteristic.