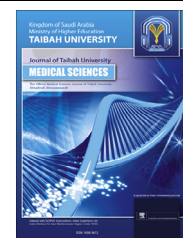




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Journal of Taibah University Medical Sciences

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## Experimental Study

# Effectiveness of text message reminders on nonattendance of outpatient clinic appointments in three different specialties: A randomized controlled trial in a Saudi Hospital

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Received 20 September 2013; revised 18 October 2013; accepted 20 October 2013

### المخلص

أهدف البحث: يعد عدم الحضور لمواعيد العيادات الخارجية مشكلة كبيرة خاصة في المستشفيات العامة مما يؤدي إلى زيادة فترة الانتظار والاستخدام غير الفعال لموارد المستشفى. تهدف هذه الدراسة إلى تقييم فعالية خدمات الرسائل التذكيرية القصيرة إلى الهواتف النقالة للمرضى الذين لديهم مواعيد في العيادات الخارجية.

**طرق البحث:** أجريت تجربة عشوائية محكمة في ثلاثة عيادات خارجية الطب العام، والأمراض العصبية، وأمراض النساء والتوليد. وتم توزيع المرضى المؤهلين عشوائياً لتلقي إما رسالة تذكير بموعدهم في العيادة الخارجية (مجموعة التدخل) أو عدم الحصول على أي تذكير (مجموعة التحكم). استخدمت قاعدة البيانات الإلكترونية للمستشفى لجمع المعلومات عن مواعيد المرضى، ورقم الهاتف النقال، ونوع العيادة والخصائص الأخرى للمرضى. النتيجة الأولية التي درست كانت قياس معدل عدم الحضور. استخدمت الدراسة تحليل مربع كاي وتحليل الانحدار اللوجستي متعدد المتغيرات لمقارنة معدل عدم الحضور بين المجموعتين.

**النتائج:** تم اشراك 1499 مريضاً في ذراعي الدراسة بين إبريل ويونيو 2011م. وتم تقسيم المجموعات إلى (الطب العام 502 مريضاً، الأمراض العصبية 297

مريضاً، أمراض النساء والتوليد 700 مريضاً). وكان معدل عدم الحضور أقل بشكل ملحوظ في المجموعات التي تم تذكيرها بالمقارنة مع المجموعات التي لم يتم تذكيرها في عيادات الطب العام والأمراض العصبية (26.3% مقابل 39.8% و 29.3% مقابل 43.9%، على التوالي قيمة  $P \leq 0,02$ ). لم يكن هناك اختلاف ذو أهمية في معدل الحضور بين مجموعات التذكير وعدم التذكير في عيادة أمراض النساء والتوليد (26.6% مقابل 27.9% قيمة  $P= 0,36$ ).

**الاستنتاجات:** التذكير بواسطة رسالة نصية فعال في تخفيض معدل عدم الحضور لمواعيد العيادة الخارجية على الرغم من أنه قد لا يكون فعالاً في جميع التخصصات.

**الكلمات المفتاحية:** عدم الحضور; مواعيد العيادات الخارجية; رسالة نصية; تجربة عشوائية محكمة; المملكة العربية السعودية

### Abstract

**Objectives:** Nonattendance at outpatient appointment is a major problem particularly in public hospitals that leads to long waiting time and inefficient use of hospital recourses. The aim of this study was to evaluate the

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Peer review under responsibility of Taibah University.



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effectiveness of sending short message service (SMS) reminders to the mobile phones of patients scheduled for an outpatient appointment on nonattendance rate.

**Methods:** A randomized controlled trial was conducted at three outpatient clinics (General Medicine (GM), Neurology (Neuro), Obstetrics and Gynecology (OB/GYN)). Eligible patients were randomly allocated to either receive SMS reminder message of their outpatient appointment (intervention group) or receive no reminder (control group). The electronic database of the hospital was used to collect patient appointment information, mobile phone number, type of clinic and other patient characteristics. The primary outcome measure was nonattendance rate. Chi-square test and multivariate logistic regression were used to compare nonattendance rate between the two groups.

**Results:** A total of 1499 patients were entered in the two arms of the study between April 2011 and June 2011. These were divided as follows (GM = 502, Neuro = 297, and OB/GYN = 700). The nonattendance rate was significantly lower in the reminder groups compared to the non-reminder groups in the GM and Neuro clinics (26.3% vs. 39.8% and 29.3% vs. 43.9%, respectively  $P \leq 0.02$ ). There was no significant difference in the nonattendance between the reminder and non-reminder groups in OB/GYN clinic (26.6% vs. 27.9%,  $P = 0.36$ ).

**Conclusion:** SMS text message reminders are effective in reducing the nonattendance rate in outpatient clinics though may not be as effective in all specialties.

**Keywords:** Nonattendance; Outpatient clinic appointment; Randomized control trial; Saudi Arabia; Text messaging

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## Introduction

Nonattendance at hospital outpatient clinics is a common problem that has been reported to range from 5.4% to 50.2%.<sup>1-3</sup> Nonattendance has a negative impact on the efficiency and effectiveness of delivery of outpatient care. Additionally it may result in poorer outcome and increased morbidity as a result of delayed diagnosis and non-continuity of care for both the non-attenders and other patients who could not get an appointment.<sup>4-6</sup>

Several studies mentioned different causes for nonattendance such as transportation difficulty, mix up in date and time of the appointment, or sense of improvement.<sup>7,8</sup> One important cause was found to be patients forgetting their appointment.<sup>9</sup> It is therefore expected that reminders of the outpatient appointment could significantly increase the attendance rate.<sup>10</sup> Various methods of patient reminders have been studied; posted letters, automated phone calls, and personalized phone calls.<sup>4,11-14</sup> Most of these studies have shown a significant reduction in nonattendance rates regardless of the setting or method used, but they were labor intensive.<sup>11-13,15</sup>

Short messaging service (SMS), a rapidly spreading technology in both developed and developing countries has the potential to reach a large number of individuals at a relatively low cost.<sup>16</sup> Several studies have shown that the use of SMS appointment reminders was effective in reducing outpatient nonattendance and more cost-effective than other phone reminder methods.<sup>7,17-19</sup> SMS text messaging has many characteristics that make it particularly suitable in Saudi Arabia. Mobile phones are widely used across different ages and social groups and are probably the most widely used method of communication.<sup>20</sup> SMS texting is highest among the younger age, who are known to have the highest nonattendance rates for medical appointments.<sup>21</sup> Mobile phones are also personal, which enhances privacy and increases the ability to reach the intended person directly and in short time.

Although there is an abundance of studies that examined the effectiveness of SMS reminders to improve patients' attendance in outpatient clinics, most of these studies are observational studies and few are randomized controlled trials (RCT). In Saudi Arabia there is only one historical cohort study, we know of, that reported on the effectiveness of SMS reminder system on attendance rate in outpatient clinics of a Saudi hospital.<sup>22</sup> However, this study was limited by its design as an observational study. Therefore we conducted this RCT to determine the effectiveness of appointment reminders sent as short text message (SMS) to patients' mobile phones to reduce nonattendance rate at an outpatient clinic in a teaching hospital in Saudi Arabia. Using a convenient method such as SMS to reduce nonattendance, could be of great benefit in reducing the cost and other related drawbacks to the healthcare system from missed appointment in an already overcrowded hospital outpatient clinics.

## Materials and Methods

### *Design and setting*

This randomized control trial was conducted in the outpatient clinic at the King Fahad teaching hospital during the period from April 5, 2011 to June 4, 2011. Outpatient clinics of General Medicine (GM), Neurology (Neuro), and Obstetrics & Gynecology (OB/GYN) were included in this study. These clinics were selected because they were known to have the highest patient volume in the hospital. The services provided in outpatient clinics are free of charge.

### *Intervention*

All patients whose mobile numbers were documented in the hospital electronic database and were due to attend an appointment during the following week to one of the selected clinics were eligible to be included in the study. Because the SMS reminder messages will be sent in Arabic, non-Arabic speaking patients were excluded from the study because they represented a small percentage of the clinic use (~10%) and it was known anecdotally that they tended not to miss their appointments. Each week a list of patients with appointment in each of the three clinics for the following week was retrieved from the hospital's electronic database. For each clinic a random sample of patients was selected from the list of each day of the week. Using computer generated random number, these patient appointments were then randomly allocated to either

يمكنك الإرسال إلى أرقام من داخل المجموعات وذلك باختيار المجموعة ثم تحديد الأرقام ثم الضغط على اعتمد الأرقام

أرسل إلى أرقام من داخل المجموعات

اختر المجموعة  
تفريغ  
اعتمد الأرقام

966506969624 966505925985 9665558980468 966551544479 966500102768 9665

Patients mobile number

أرسل إلى الأرقام

مثال : 966000000000X ، يمكنك كتابة أرقام غير مسجلة عندك وأفضل بينهم بعلامة \* ، من غير علامات الأقباس.

أرسل للمجموعات

الأرسال باسم الرسالة

| عدد الأرقام | اسم المجموعة | عدد الأرقام | اسم المجموعة |
|-------------|--------------|-------------|--------------|
|             | Sender name  |             | KFHU         |

طلب إسم مرسل

السلام عليكم ورحمة الله .. نود تذكيركم لحضور موعدكم في عيادة النساء والولادة وذلك يوم الأحد (غدا) 3 رجب الموافق 5 يونيو .. مستشفى الملك فهد الجامعي بالخبر

Message content

عدد الحروف 162 حرف - باقي 328 حرف - تكلفة الإرسال 3 رسالة

Figure 1: SMS messages sent manually to patients 48 h before the appointment.

receive a reminder text message (intervention group) or to not receive such a reminder (control group). This process continued over the study period until the required sample size was collected. A standard text message reminder (Figure 1) was sent manually to the intervention group 48 h before the appointment using one of the phone service providers in Saudi Arabia. At the end of the study, we conducted a telephone survey of a random sample of participants in the intervention group regarding their perception toward the SMS reminder. Other data collected from the electronic database included: patient age, sex, nationality, clinic specialty, type of visit (first contact/had previous contact) and whether the patient attended the scheduled appointment (Yes/No). The sequence of the randomization was concealed from the IT individual who provided the appointment list. The statistician was also blinded to the patient group. This study was approved by the institutional review board of the hospital. Patient approval was not thought of because patients provided their phone number at registration with the understanding that the hospital may use the number as a contact source to the patient.

### Sample size

To have a power of 99% and alpha of 5%, 250 per group were required from the General Medicine clinic to be able to detect 15% reduction in nonattendance due to SMS reminder. Given the lower percentage of patients attending OB/GYN clinic who miss their appointment among the control patients, 350 patients were required per group to detect a reduction of 15% in the nonattendance rate keeping the power at 99% and alpha at 5%. Because of budgetary and time limit, only 99 patients from the Neurology clinic were expected to be included in the intervention group. To keep the power at 80% and alpha at 5%, 198 patients were required to be included in the control group. Expecting a satisfaction level of 70%, 230 patients were required to estimate 95% CI for the satisfaction level with SMS reminders of  $0.70 \pm 0.05$ .

### Statistical analysis

The statistical analysis was performed using Stata 11 (Stata Corp., College Station, TX, USA). Analysis was conducted based on intention to treat. Patients were considered non-attenders if their visit outcome was registered in the electronic database as “no-show”. To compare the baseline characteristics of patients randomized to receive the reminder SMS or not to receive the reminder, Chi-Square was used for categorical variables and *t*-test was used for continuous variables. The nonattendance rate in the SMS reminded group was compared with those in the non-reminded group using Chi-Square test. For better control of confounding factors, three multivariate logistic regression models (one for each clinic type) were conducted with attendance status as the dependent variable (Yes/No) and SMS reminder (Yes/No) as the main exposure factor. Other factors controlled for in the model included patient age, gender, nationality (Saudi/non-Saudi), type of visit (first contact/had previous contact). For the odds ratio calculation the non SMS reminder group was used as the reference group. Odds ratio and 95% confidence intervals are presented. *P*-value < 0.05 was considered to be statistically significant. The analyses were done separately to each of the 3 clinics.

### Results

A flow chart of the study participants in this randomized controlled trial is shown in Figure 2. A total of 2184 eligible patients with complete information and who had an outpatient appointment with one of the three targeted clinics during the study period were randomly allocated as follows: (1) 251 patients from the GM clinic were allocated to receive a reminder SMS and a similar number was allocated to the no reminder group; (2) 350 patients from OB/GYN clinic were allocated to receive the reminder SMS and a similar number allocated to not receive such a reminder; (3) 99 patients from the

**Table 1: Baseline characteristics of patients according to SMS reminder group for each clinic.**

| Characteristics  | General Medicine          |                           | Neuro                     |                          | OB/GYN                    |                           |
|------------------|---------------------------|---------------------------|---------------------------|--------------------------|---------------------------|---------------------------|
|                  | No reminder               | Reminder                  | No reminder               | Reminder                 | No reminder               | Reminder                  |
|                  | No. (%)<br><i>n</i> = 251 | No. (%)<br><i>n</i> = 251 | No. (%)<br><i>n</i> = 198 | No. (%)<br><i>n</i> = 99 | No. (%)<br><i>n</i> = 350 | No. (%)<br><i>n</i> = 350 |
| Nationality      |                           |                           |                           |                          |                           |                           |
| Saudi            | 222 (88.4)                | 234 (93.2)                | 180 (90.9)                | 88 (88.9)                | 324 (92.6)                | 322 (92.0)                |
| Non-Saudi        | 29 (11.6)                 | 17 (6.8)                  | 18 (9.1)                  | 11 (11.1)                | 26 (7.4)                  | 28 (8.0)                  |
| Sex              |                           |                           |                           |                          |                           |                           |
| Female           | 146 (58.2)                | 143 (57.0)                | 108 (54.5)                | 51 (51.5)                | 350 (100)                 | 350 (100)                 |
| Male             | 105 (41.8)                | 108 (43.0)                | 90 (45.5)                 | 48 (48.5)                | –                         | –                         |
| Visit type       |                           |                           |                           |                          |                           |                           |
| First contact    | 23 (9.2)                  | 13 (5.2)                  | 51 (25.8)                 | 33 (33.3)                | 267 (76.3)                | 284 (81.1)                |
| Previous contact | 228 (90.8)                | 238 (94.8)                | 147 (74.2)                | 66 (66.7)                | 83 (23.7)                 | 66 (18.9)                 |
| Mean age (SD)    | 53.0 (13.3)               | 52.0 (15.6)               | 46.9 (11.8)               | 45.6 (13.9)              | 38.23 (10.7)              | 37.3 (12.1)               |

SD = standard deviation.

**Table 2: Nonattendance comparison between patient who were not sent SMS reminder and those who were sent a reminder during the study period.**

| Clinic type      | SMS reminder ( <i>a</i> )<br>No. (%) | Non-SMS reminder ( <i>b</i> )<br>No. (%) | Risk difference*<br><i>a</i> – <i>b</i> | Risk ratio†<br><i>a</i> / <i>b</i> | 95% CI of risk ratio |
|------------------|--------------------------------------|--|---|------------------------------------|----------------------|
| General Medicine | 66/251 (26.3)                        | 100/251 (39.8)                           | –13.5%‡                                 | 0.66                               | 0.48–0.82            |
| Neurology        | 29/99 (29.3)                         | 87/198 (43.9)                            | –14.6%§                                 | 0.67                               | 0.47–0.94            |
| OB/GYN           | 93/350 (26.6)                        | 104/350 (29.7)                           | –3.1%                                   | 0.90                               | 0.70–1.13            |
| Total            | 183/700 (26.1)                       | 291/799 (36.4)                           | –10.3%¶                                 | 0.72                               | 0.62–0.85            |

\* Percentage reduction in nonattendance due to SMS reminders. † Relative reduction in nonattendance due to SMS reminders.

‡ < 0.001.

§ 0.02.

|| 0.36.

¶ < 0.01.

Neurology clinic were allocated to receive the reminder SMS and 198 allocated to not receive the SMS reminder. Budget and time limitation of the study were the reasons that SMS messages were sent to only 99 patients in the Neurology clinic.

Baseline characteristics of both groups are shown in Table 1. Comparison between the intervention and control groups showed equal distribution of different patient characteristics and there were no statistically significant differences in patient characteristics between groups within each of the clinic types. Comparisons in the nonattendance rate among both groups in each clinic, shown in Table 2, reveal that SMS reminder was effective in reducing the nonattendance rate in GM clinic (nonattendance of 39.8% vs. 26.3% for control and intervention groups respectively,  $P < 0.001$ ) and in Neurology clinic (nonattendance of 43.9% vs. 29.3% for the control and intervention groups respectively,  $P = 0.02$ ). On the other hand, for the OB/GYN clinic there was no significant difference in the nonattendance rate between the two groups (nonattendance of 29.7% vs. 26.6% for the control and intervention groups respectively,  $P = 0.36$ ).

As shown in Table 3, using subgroup multivariate logistic regression to determine the independent effect of intervention controlling for residual confounding, patients who received SMS reminders were less likely to miss their appointment compared to those who did not receive the SMS reminders in the GM and Neuro clinic (OR 0.56, 95% CI 0.38–0.82 and OR

0.53, 95% CI 0.32–0.90 respectively). On the other hand OB/GYN patients did not show better attendance due to SMS reminders (OR 1.00, 95% CI 0.71–1.42).

Table 4 presents patient satisfaction with the SMS reminder service. Of the 230 patients we called, 189 (82%) answered the phone. Of these 166 (88%) agreed to continue the interview. All patients surveyed agreed to keep this service, 77% indicated that it helped them to remember their appointment.

## Discussion

Our study demonstrated that sending SMS reminder to patients' mobile phone was an effective means of improving attendance rate at outpatient clinic. We also found that SMS reminders were not effective in reducing nonattendance rate in all clinic types to the same degree. For example, in OB/GYN clinic, patient nonattendance rate was similar irrespective of receiving or not receiving SMS reminder.

The nonattendance in our control group was higher than that of other studies; confirming our anecdotal beliefs that nonattendance is an important problem in our study hospital.<sup>23,24</sup> Interestingly, the nonattendance in the control group was significantly lower in the OB/GYN clinic compared to other clinics ( $P < 0.01$ ). It is possible that a large number of these patients were pregnant women attending for their prenatal care and who were keener to keep their appointment.



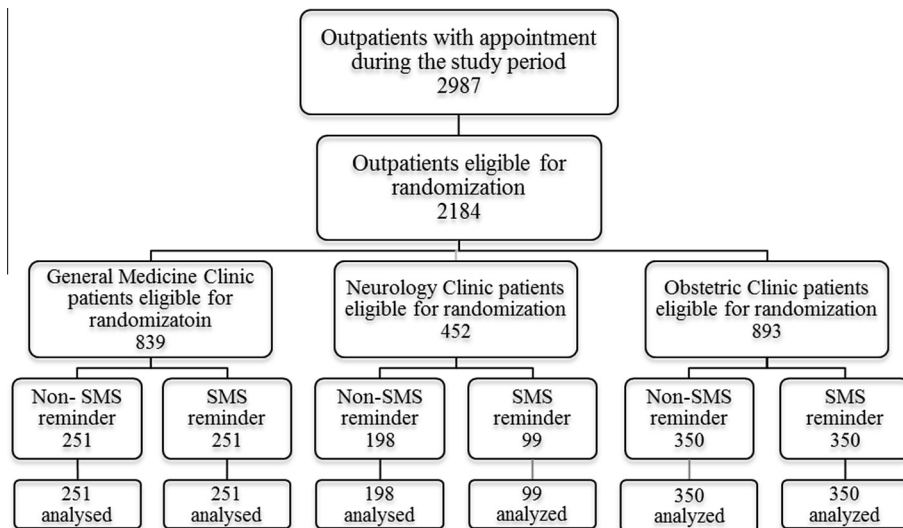


Figure 2: Study population flow-chart.

Table 3: Odds ratio of nonattendance and 95% CI using multivariate logistic regression.

| Characteristic             | General Medicine     | Neurology            | OB/GYN              |
|----------------------------|----------------------|----------------------|---------------------|
| SMS reminder               | 0.56*<br>(0.38–0.82) | 0.53*<br>(0.32–0.90) | 1.00<br>(0.71–1.42) |
| Age<br>(10 years increase) | 0.89<br>(0.78–1.02)  | 0.99<br>(0.82–1.21)  | 1.21<br>(1.03–1.42) |
| Saudi                      | 0.75<br>(0.39–1.43)  | 1.03<br>(0.46–2.31)  | 0.33<br>(0.20–0.53) |
| First contact              | 5.19<br>(2.40–11.21) | 0.86<br>(0.50–1.46)  | 1.15<br>(0.76–1.72) |
| Male                       | 1.08<br>(0.73–1.60)  | 1.02<br>(0.64–1.64)  | –                   |

Numbers in the table are odds ratio and (95% confidence interval); Reference groups not receiving SMS reminder, non-Saudi, had previous contact, female.

\*  $P < 0.001$

Table 4: Satisfaction results with the SMS reminder service.

| Item                               | $N = 166$ | Percent agree (%) |
|------------------------------------|-----------|-------------------|
| Had a chance to read the message   | 163       | 99                |
| SMS clarity                        | 159       | 96                |
| Keep the message service           | 166       | 100               |
| Messages help patients to remember | 128       | 77                |

The overall reduction in our study of 10.3% (from 36.4% to 26.1%) in nonattendance due to the use of SMS reminders was more than double of what was found by Altuwajiri et al.<sup>22</sup> but was in line with that of other studies.<sup>4,7,16,24–26</sup> On the other hand, after excluding patients from OB/GYN clinic in our study, reminders reduced nonattendance among those who received the reminder by 14.5% (from 41.6% to 27.1%) which was much higher than the rate found in these studies.

For example the study by Downer et al.<sup>4</sup> found an overall reduction rate of 9.2% (from 23.4% to 14.2%). In another study by da Costa et al.<sup>16</sup> the reduction rate was 6.2% (from 25.6 to 19.4%).

In this study, specialty was found to be an important factor affecting the effectiveness of SMS reminders in reducing nonattendance for outpatient appointments; a finding that was corroborated by others.<sup>4,7,27</sup> In the study by Downer et al. the reduction in nonattendance rates with the use of SMS reminders ranged from 3% to 27% with surgical departments having the least effectiveness.<sup>4</sup>

Possible reasons for variation between these studies and ours include difference in settings or the sociocultural difference between patients. It could also be due to the difference in the behavior of the patients in our study compared to patients in these studies. Patients in our study may find it easier to not show up for their appointment because of the absence of financial cost for nonattendance. It is also possible that the short period of our study did not incorporate the confounding effect of seasonality.

Appointment reminder is only one use of SMS texting. High patient satisfaction with the messaging service as indicated in our survey indicates that text messages could be used for more interaction with patients. Patients could be allowed to reply to the reminder by texting their approval, cancellation, or requesting date change.<sup>10</sup> If patients are planning not to attend, they could be encouraged to cancel appointments in a timely manner, empty slots can be filled with patients on the waiting list.<sup>9</sup> Other potential uses of SMS technology include patient reminders to take medications, instructions before tests, as well as sending test results. Given the large number of non-Arabic speaking expatriates in Saudi Arabia, converting the language of these text messages to other languages is also of a major advantage for non-Arabic speaking patients.

Another advantage of SMS technology is that it requires minimal investment in IT infrastructure. Once the IT software for sending automated SMS messages is integrated with the hospital administrative database, the cost of running the service increases very little as the number of SMS reminders increases. Additionally, being an automated service, it does not require staff training or involvement in the process.<sup>7</sup>

Using SMS reminders is not without difficulties which need to be addressed. People tend to frequently change their mobile phone numbers requiring continuous update. Furthermore, users of the mobile phone may not be familiar with using it for reading and sending text messages. This is probably true for older people or illiterates.

#### *Perception of the SMS message*

Overwhelming percentage of the patients who received the SMS reminder read message and found it to be clear. Additionally a high percentage of these patients felt that the SMS helped them remember their appointment. These results are consistent with other studies.<sup>24,28,29</sup> One study reported that 98% of patients with mobile phone were willing to receive routine mobile phone text message reminders of their outpatient appointment.<sup>28</sup> In another study SMS messaging was found to be the most preferred method of appointment reminder.<sup>30</sup>

Our assessment of the effectiveness of SMS text message reminders has some potential limitations. First, this study was conducted in a free for service setting, which may have represented a systematically different group of patients in terms of nonattendance pattern compared to those settings with fee for service appointments. Second, information about patient sociodemographic characteristics such as education, income, and beliefs was not available. Studying these factors could better explain why patients do not attend their appointment particularly those receiving the SMS reminder. Third, phone numbers in the hospital database may be incorrect or outdated. Other authors have identified outdated phone numbers as a problem for reminder systems.<sup>12</sup> Fourth, we are also not aware of the number of patients who were unfamiliar with using text messaging and so unable to read the reminder. However, this limitation potentially underestimates the positive effectiveness of SMS reminders to reduce nonattendance rate. Fifth, this study did not include non-Arabic speaking patients. However, these patients represent small percentage of patients using the clinic. It is also expected that Non-Arabic speaking patients will have similar if not better effectiveness of the SMS reminders. Several studies conducted in other countries consistently indicated effectiveness of SMS reminders.<sup>18,31,32</sup>

Finally, our study was conducted only during a 3 month period, and so did not take account of seasonal and monthly variation in nonattendance.

#### **Conclusion**

The use of SMS reminders for outpatient appointments was associated with a significant reduction in nonattendance rate, although it varies by clinic speciality. Future studies should look at the effect of reminders combined with rewards for attendance or sanctions for nonattendance. Other uses of the SMS text message or interventions other than appointment reminders also need to be studied.

#### **Conflict of interest**

No financial or other relationship that lead to conflict of interest.

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