

The effect of integrating short messaging services' reminders with electronic medical records on non-attendance rates

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ABSTRACT

الأهداف: قياس التأثير الذي يتركه دمج خدمات التذكير برسائل قصيرة مع نظام السجلات الطبية الإلكترونية على معدلات عدم حضور مواعيد العيادات الخارجية في المستشفيات بالمملكة العربية السعودية.

الطريقة: أُجريت هذه الدراسة الاستطلاعية خلال الفترة من يناير إلى مارس 2010م حيث جرى جمعُ المعطيات من 16 عيادة في مدينة الملك عبد العزيز الطبية وهي إحدى مستشفيات الشؤون الصحية بالحرس الوطني، الرياض، المملكة العربية السعودية. اشتملت هذه المعطيات على عدد المواعيد التي لم يحضر إليها المرضى في العيادات خلال فترة 3 أشهر (من مارس إلى مايو) على سنتين متعاقبتين، وذلك قبل تطبيق خدمة التذكير بالمواعيد برسائل نصية قصيرة عام 2008م وبعد تطبيقها عام 2009م.

النتائج: لقد كانت النسبة المئوية الوسطية لعدم الحضور هي 23.90% خلال العام 2008م (بانحراف معياري قدره 0.0578) و19.77% خلال العام 2009م (بانحراف معياري قدره 0.0386) وذلك بالنسبة إلى 16 عيادة خارجية في مركز الرعاية المتنقلة، مع انخفاض بنسبة 4.13% ($p < 0.001$, T-value = 4.81).

خاتمة: لقد كان إدماج تكنولوجيا الرسائل النصية القصيرة مع أنظمة السجلات الطبية الإلكترونية فعالاً في التقليل بشكل ملحوظ من معدلات التغيب عن المواعيد في العيادات الخارجية بمدينة الملك عبد العزيز الطبية بالرياض.

Objectives: To measure the effect of integrating short messaging service (SMS) reminders with an electronic medical record (EMR) system on non-attendance rates in outpatient clinics in a Saudi hospital.

Methods: Pre- and post- observational studies were conducted at King Abdulaziz Medical City and National Guard Health Affairs, Riyadh, Kingdom of Saudi Arabia from January 2010 and March 2010. Data collected from 16 out-patient clinics included the number of non-attended appointments at the clinics in a 3-month period (March-May)

in 2 consecutive years: pre-implementation of SMS appointment reminders in 2008 and post-implementation in 2009.

Results: The mean non-attendance rates for the 16 outpatient clinics during 2008 were 23.9% (SD 0.0578) and for 2009 were 19.8% (SD 0.0386) with a 4.1% ($p < 0.001$, T-value = 4.81) reduction rate.

Conclusion: Integrating SMS reminders with EMR systems showed a positive effect on the reduction of the non-attended appointments at King Abdulaziz Medical City, Riyadh, Kingdom of Saudi Arabia.

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An increasing number of hospitals have employed information and communication technology (ICT) to improve health outcomes, reduce medication errors, increase health efficiency, and eliminate unnecessary costs. The use of ICT in healthcare has steadily expanded from administrative and financial operations to more clinically oriented systems including the current focus on electronic medical records (EMR). Moreover, ICT solutions are used to improve the use of resources in healthcare including appointment slots.¹ Hospital appointment non-attendance is a major issue for healthcare organizations, reducing the efficiency and effectiveness of the delivery of outpatient health care

and causing substantial financial losses for health care systems. In the United Kingdom, it is estimated that approximately £790 million are lost every year because of appointment non-attendance at clinics, hospitals, and primary care centers.² In addition, appointment non-attendance negatively affects patients, for example, by leading to a higher risk of re-hospitalizations. Moreover, appointment non-attendance coincides with patients skipping their medications, leading to poor disease management of diseases, and increased waiting time for other patients leading to delays in diagnosis and decreased monitoring of long-term chronic conditions. These factors can, in turn, lead to increased patient morbidity.²⁻¹⁰ Patients report several reasons for appointment non-attendance including: forgetting on the appointment, confusion over the date, time, and location of the appointment, and family or work commitments.^{4,5} Beside the above-mentioned factors, the use of Hijra calendar may contribute to appointment non-attendance in Saudi Arabia because it can lead to confusion over the appointment date. Many hospitals have applied reminding solutions in order to reduce the non-attendance rate. Methods of delivering appointment reminders include personalized and automated telephone calls, posted letters, awareness campaigns, emails, and mobile short messaging service (SMS) messages.² Short messaging service reminders have many characteristics; that are specifically ideal for healthcare settings. These characteristics include: direct patient communication, privacy, confidentiality, rapid message delivery and response receipts, and convenience for both health providers and patients. Short messaging service messaging technology also

allows the simultaneous dispatch of many messages, which reduces labor expenditures.^{2,9} This study aims to evaluate the effect of sending SMS reminders to patients with outpatient clinic appointments on non-attendance rates. The authors believe that this article is important as there has been no published study assessing the impact of SMS reminding system in Saudi healthcare.

Methods. National Guard Health Affairs (NGHA), Riyadh, Kingdom of Saudi Arabia was one of the early adaptors of Eastern Mediterranean Region (EMR) in the Middle East. It started the EMR implementation in 2001 and concluded the first phase to implement the system in its 900-bed medical city in Riyadh (King Abdulaziz Medial City [KAMC]) in September 2004.¹¹ Moreover, in order to reduce the rate of appointment non-attendance and enhance the quality of service at KAMC's Ambulatory Care Center (ACC) of NGHA, which includes 19 outpatient clinics, an SMS reminding system was implemented in mid-June 2008. The system was fully integrated with the NGHA's EMR database to retrieve updated outpatient clinic' schedules (with additional patient/visit related information, such as mobile phone numbers, and the clinic name). The architecture of the SMS reminding system is shown in Figure 1.

When an appointment is scheduled for a patient in the EMR, 2 automated SMS messages are scheduled to be sent to the concerned patient; the first one is 5 days prior to the appointment date which represents the minimum amount of time that allows for the slot to be utilized for another patient, and the second reminder is

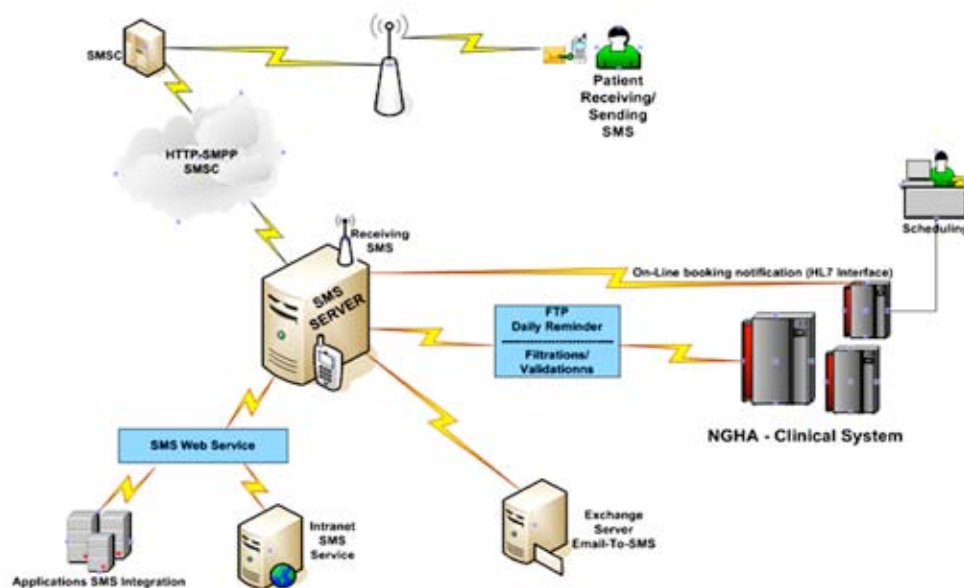


Figure 1 - The short messaging service (SMS) system architecture at National Guard Health Affairs (NGHA).

a day prior to the appointment date. Because the vast majority of KAMC patients are native Arabic speakers, Arabic is used in the reminder message. The translated content of the message sent to patients is as follows: "This message is to remind you of <PATIENT NAME>'s appointment at DAY <Hijra Date>, <Gregorian Date> at <time> in <Clinic Number>. For inquiries please call <phone number> King Abdulaziz Medical City-Riyadh". It is also important to mention that KAMC did not have any other appointment reminding system in place prior to the SMS implementation.

This study was a retrospective data analysis study, in which the appointment non-attendance rate was analyzed before and after the implementation of the SMS reminder system. The study was conducted at KAMC from January 2010 to March 2010. Data were collected from ACC out-patient clinics at KAMC. King Abdulaziz Medical City provides health care to all Saudi National Guard soldiers, employee and their dependents in Riyadh and other regions around the kingdom. We believe that this population has no distinctive characteristics of any other Saudi population. The clinics provide all types of specialty care (all major medical specialties- medicine, surgery, pediatric, Obstetrics and Gynecology- with their subspecialties) at tertiary care level. Ambulatory Care Center clinics consists of 19 outpatient clinics; however, 3 clinics were excluded from this study because of inactivity during some portions of the study period.

Data collection and cleaning. In this study we analyzed data from NGHAs EMR system including the number of booked appointments and the number of non-attended appointments for each clinic. These data were

collected from March to May 2008 period (pre-SMS implementation period) and the period between March and May 2009 (post-SMS implementation period). In order to avoid seasonal variations, we deliberately ignored the 3 months following implementation and chose the same 3 months in the next year. We, then, calculate the appointment non-attendance rates for each clinic during the pre- and post- SMS implementation periods by dividing the number of non-attended appointments over the number of scheduled appointment.

The data were imported to MiniTab® Version 15 statistical analysis software. Using this software, we conducted a paired sample t-test for statistical significance.

Results. Table 1 lists the number of booked appointments in the pre- SMS and post- SMS periods. The number of non-attended appointments in the 2 periods, and the non-attendance rates in the 2 periods for each clinic. The mean percentage of non-attendance rates for the clinics during the pre- and post- SMS implementation periods were 23.90% (SD 0.0578) and 19.77% (SD 0.0386) respectively as shown in Table 1. A noticeable reduction by 4.13% ($p < 0.001$, T-value = 4.81) in non-attendance rate was achieved after the implementation of SMS reminding system. To eliminate any other external factors that may have affected our results, we obtained data for the same 3 months period in 2007 to compare it with data obtained for 2008. It was found that the mean non-attended appointments rates in 2007 and 2008 were mostly similar; (23.27%, SD 0.0573) and (23.90 %, SD 0.0578), with insignificant difference ($p = 0.134$, T-value = -1.58).

Table 1 - The rates of non-attendance for the pre and post short messaging service (SMS) reminders including t-test and p -values.

Clinic name	Pre SMS study period (March-May 2008)			Post SMS study period (March-May 2009)		
	Booked appointments	Non-attendance	Rate of non-attendance %	Booked appointments	Non-attendance	Rate of non-attendance %
Clinic 101	15933	3726	23.4	15222	3255	21.4
Clinic 102	534	78	14.6	440	43	9.8
Clinic 103	4035	1547	38.3	4335	1006	23.2
Clinic 104	10925	2231	20.4	11037	2185	19.8
Clinic 201	8565	2866	33.5	8675	2381	27.5
Clinic 202	12189	3363	27.6	10825	2529	23.4
Clinic 203	1261	264	20.9	1237	198	16.0
Clinic 204	17111	3988	23.3	16277	3090	18.9
Clinic 301	13796	3112	22.6	14377	2837	19.7
Clinic 302	10626	2227	20.9	9983	2021	20.2
Clinic 303	9204	2138	23.2	8228	1557	18.9
Clinic 304	9677	1956	20.2	9104	1592	17.5
Clinic 401	7994	1712	21.4	9448	1927	20.4
Clinic 402	6214	1233	19.8	7001	1240	17.7
Clinic 403	5195	1533	29.5	4928	1139	23.1
Clinic 404	10782	2439	22.6	10436	1956	18.7
Mean±SD		23.9% ± 0.0578			19.77% ± 0.0386	
P -value and T-value between the 2 groups: $p = 0.006$, $t = 4.349$						

Finally, in order to strengthen our findings, we calculated the appointment non-attendance rate for the period March to May 2007 in order to compare it with the same result for 2008.

Discussion. A noticeable reduction in the non-attended rates in KAMC outpatient clinics was observed after the implementation of an SMS appointment reminding system. This result supports the findings reported in the literature evaluating the capability of SMS reminders to significantly improve out-patient attendance rates. The reduction rate which is 4.13%, actually represent a drop by 20% from the primary non-attendance rate, this means significant increase in the clinic attendance. The reduction rate (4.13%) was achieved in spite of the fact that only 70% of the patients have their mobile stored in the EMR system at KAMC. However, mobile phone ownership in Saudi Arabia continues to rapidly increase; a recent study showed the number of mobile phones has reached 186% of the Saudi population.¹² Better results are expected in the future as registration offices at KAMC begin consistently requiring patients to update their information, including mobile phone numbers, during each visit. This will allow patients to continue receiving SMS reminders.

Study limitations. In this study, a number of limitations were encountered such as: (1) inability to identify the patients who actually received SMS against those who did not receive the reminder at all in order to track the rate of attendance within the same group, which would have helped us to accurately judge the association between the use of SMS reminders and the decrease in outpatient clinics' non-attendance rates; (2) inability to study the effect of using SMS reminders on the cancellation of appointments and re-use of these slots by other patients; (3) inability to calculate the actual savings resulted from the SMS reminding system, due to the fact that KAMC is a government hospital that provides free of charge services and thus lacks billing solutions that can be used to estimate the cost saving.

In conclusion, in this study, we were able to collect data from 16 different outpatient clinics with thousands of appointments booked during the study periods. The results show that the SMS appointment reminding system reduced the number of missed outpatient appointments. One of the strengths of this system is its full integrated with NGHAs EMR system, which allows reminders to be generated automatically.

Based on our findings, we highly recommend continuous coordination with hospital administration to constantly update patients' mobile phone numbers during each visit to ensure they keep receiving

appointment SMS reminders. It is also important to have an interactive solution that allows patients to easily reply and confirm or cancel the appointment using SMS technology. This would help utilize the empty slots and save resources that were allocated for this visit. Moreover, the hospital has included in the SMS reminder messages some medical educational messages such as requesting to bring the medication list and some instructions regarding the right procedure for laboratory and medical imaging tests in order to achieve better treatment outcomes.

Furthermore, additional studies are necessary to investigate the reason for patients missing their appointments in spite of SMS reminders.

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