Investigating How the Use of Technology can Reduce Missed Appointments: A Quantitative Case study at a General Practitioner Surgery.

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Investigating How the Use of Technology can Reduce Missed Appointments: A Quantitative Case study at a General Practitioner Surgery.

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Abstract

Background: Technology is playing a major role in Primary care (PC), with short message service (SMS) systems being hailed as the answer to reducing the number of missed appointments. Research in this area has been more qualitative, focusing on whether SMS users and receivers, have positive or negative views of the SMS systems. This research paper looks at the appointment data from a large independent GP Practice in Wrexham, with circa 15,000 patients. The data covers a ten-year period from 1st September 2010 to 31st March 2020. In this period there were a total of 9,191 missed appointments out of a possible 572,794 appointments booked.

Objective: The aim of the research is to determine if SMS messaging systems reduce the number of missed appointments.

Methods: The data was gathered using SQL query reports run on EMIS web and checked for accuracy by comparing the numbers from the reports with the appointment diary. The GP appointment data was confirmed as accurate, but the nurse appointment data did not match up, therefore only the GP appointments were looked at.

Results: The total number of missed appointments pre-SMS (5848) and post-SMS (3343) were analysed using Mann-Whitney (MW) tests for yearly, quarterly, and monthly data. The results of the tests showed that there was a significant reduction (43%) in the number of missed appointments after the introduction of SMS messaging. MW tests looking at female and male data also showed a significant decrease in the number of missed appointments. Comparing the data of female and male for any difference between the genders clearly showed no significant difference in missed appointments.
The data was furthered categorized in age ranges of ten years or five years and analysed using Kruskal Wallis (KW) tests. Comparing the data for missed appointments, the age range that significantly missed more appointments was 20 – 25 years. The age range that had the lowest percentage of missed appointments was 70 – 75 years. The female data showed that the age range that missed significantly more appointments was also 20 – 25 years but the age range that missed the lowest percentage of appointments was 65 – 70 years. The male data showed that the age range that missed significantly more appointments was 35 – 40 years with the lowest percentage of missed appointments in the age range of 75 – 80 years.

Conclusions: The research study has conclusively shown that technology has reduced the number of GP missed appointments. The introduction of SMS messaging significantly reduced the did not attends (DNAs) and enabled the patients to cancel the appointment in good time. The results have also shown no difference between female and male DNAs', showing that gender does not influence the missed appointment data.

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Investigating How the Use of Technology can Reduce Missed Appointments: A Quantitative Case study at a General Practitioner Surgery.

Abstract

Background:

SMS texting systems have been considered a potential solution to reduce missed appointments in primary care. Existing research in this area focuses on qualitative studies investigating the attitudes of SMS text users and receivers. This study aims to examine appointment data from an independent general practitioner (GP) surgery in Wrexham, with circa 15,000 patients, to determine the impact of SMS texting systems on reducing missed appointments.

Objective:

The objective of this study is to investigate whether the utilization of SMS texting systems can effectively reduce missed appointments.

Methods:

To gather data for the study, structured query language reports were run on EMIS Web, the UK's most widely used clinical system. The data covered ten years from September 1, 2010, to March 31, 2020. The accuracy of the data was verified by cross-referencing it with appointment diary records. Mann-Whitney and Kruskal-Wallis tests, chosen for their suitability in comparing groups in non-parametric settings, were conducted in Microsoft Excel due to its accessibility.

Results:

Mann-Whitney and Kruskal-Wallis tests were conducted to compare pre- and post-text messaging periods. The results revealed a significant 42.8% reduction in missed appointments (5848 and 3343, respectively) (P<.001). Further analysis of demographic characteristics revealed interesting trends, with no significant difference in missed appointments between genders, and variations observed across different age groups. The medians of missed appointments show no significant difference between genders (female 1.55, male 1.61, P=.73). Despite the prevalence of mobile phone usage among young adults aged 20-25, they exhibited the highest missed appointment rates (848), while the 75-80yrs group had the lowest (377) out of 7256 (P<.001). Analysis by age and gender indicated inconsistencies: females aged 20-25 (571 out of 4216) (P < .001) and males aged 35-40 (306 out of 3040) (P < .001) had the highest rates, while females aged 70-75 (177 out of 4216) and males aged 75-80 (129 out of 3040) had the lowest.

Conclusions:

This study demonstrates that SMS texting systems in primary care can significantly reduce missed appointments. Implementing technology such as SMS text messaging systems enables patients to cancel appointments on time, leading to improved efficiency in primary care settings.

Keywords: National Health Service, Primary Care, SMS texting systems, Quantitative Research, Kruskal-Wallis tests, Mann-Whitney tests.

Introduction

In recent years, primary care has adopted text messaging systems for patient communication, yet their efficacy in achieving positive outcomes remains unknown. For GP practices, the NHS sets annual targets that determine their funding. Since 2019, in addition to clinical outcomes, there has

been a shift towards enhancing accessibility and appointment availability [1].

Across all age groups, mobile phones have become ubiquitous and integral to daily life [2], facilitating the development of cost-effective bulk text messaging systems for businesses [3]. Text messages are universally compatible and accessible across various network speeds, without requiring upgrades [4]. While bulk text messaging has been widely explored in business, this study focuses specifically on healthcare.

Numerous scholarly articles have delved into the perspectives of patients with regard to text message reminders [5-7].

E. Sherman et al conducted a study [8], which found that while text messages were deemed useful, patients wanted the option to reply to the messages.

In their study, Maslakpak and Safaie compared treatment compliance between groups receiving text messages, reminder cards, or no reminders, and found no significant difference between reminder cards and text messages [9].

In another study by Hirst et al., patients received a postal reminder with or without a text reminder, generated by the iPlato texting system integrated with EMIS Web [10]. The results showed a slight improvement in screening uptake from 39.9% - 40.5%, but the difference was not statistically significant.

In a study involving 18138 participants, Fisher et al. [11] evaluated text messages' effectiveness and utility in healthcare. Results indicated increased appointment attendance and patient satisfaction. However, non-random sampling may compromise validity. Since participants volunteered, their willingness to engage might influence appointment attendance, potentially introducing bias to the results.

Research on GPs utilizing messaging systems predominantly investigates patient preferences for receiving text messages and doctors' willingness to send them [12]. The literature predominantly discusses the advantages and disadvantages of messaging systems from the GP standpoint, rather than assessing their impact on patient appointment attendance. Trials evaluating text reminder systems have yielded mixed results, with no significant overall improvement in attendance rates [5-6]. Even trials with substantial cohorts exhibited only a modest 0.6% attendance increase, suggesting limited benefits from text reminders [11].

This research adds to the expanding knowledge base in the field and offers insights into implementing effective appointment management strategies in primary care.

Methods

This research analyzed missed appointment data from an independent GP practice spanning a decade, from September 1, 2010, to March 31, 2020. Data was gathered from EMIS web, and the texting system, implemented on 15th September 2015, was iPlato. iPlato messages contained standard appointment information and allowed patients to respond or cancel. Before iPlato, patients often relied on appointment cards or memory. Approximately 74% of appointments were associated with a mobile number.

Data includes adults aged 18-79, excluding children due to parental responsibility for missed appointments and individuals aged 80 and older due to frailty or care home residence. Nurse data was not integrated into the system until September 2015, so only missed GP appointments were analyzed.

Data was gathered using structured query language reports. Using these reports, we could compare five years pre-and post-text messaging implementation on missed appointments over a decade. Cross-referencing the collected figures with appointment diary records ensured accuracy.

Mann-Whitney and Kruskal-Wallis tests were chosen for the quantitative analysis due to their suitability for non-parametric comparisons [13-14]. Mann-Whitney tests, recognised for their efficiency and robustness [15], assessed the gender categories, and Kruskal-Wallis tests were applied

across the age bands due to their suitability for comparing more than two groups.

Ethics Approval

The Open University Human Research Ethics Committee approved this project, HREC/4180/Sides.

Results

This research aimed to analyze missed appointment frequencies and demographic characteristics of patients who missed appointments. Out of 572,794 appointments booked, 9191 were missed with 57.5% (5286) attributed to females and 42.5% (3905) to males (Table 1).

Table 1: Population and gender descriptive statistics pre- and post-text messaging (n = 9191).

	pre-text n (%)	post-text n (%)	% decrease
Population			
	5848 (63.6)	3343 (36.3)	42.8%
Female			
	3435 (37.4)	1851 (20.1)	46.1%
Male			
	2413 (26.3)	1492 (16.2)	38.2%

The Mann-Whitney test results (Table 2) indicated higher missed appointment rates pre-texting compared to post-text implementation. This suggests that text messaging can be an effective strategy for reducing missed appointments, particularly among female patients.

Table 2: Mann-Whitney test results (n=Population (9191), Female (5286), Male (3905))

	Frequency	Pre-text (med)	Post-text (med)	u	z	*P*
Population						
	Quarterly	1.8	1.1	74	3.1	<.002
	Monthly	1.9	1.2	719	5.2	<.001
Female						
	Quarterly	1.9	1.1	72	3.2	<.002
	Monthly	1.9	1.2	694	5.3	<.001
Male						
	Quarterly	1.8	1.1	80	2.9	<.003
	Monthly	1.9	1.3	833	4.6	<.001

To assess the data more accurately, missed appointment percentages were calculated for each age range, as depicted in Figure 1. Significant differences in median missed appointment numbers across different age bands were observed (Table 3). The 20-25 age band exhibited the highest median value, while the 65-80 age bands had the lowest median value. Further information and statistical data are available in Multimedia Appendix 1.

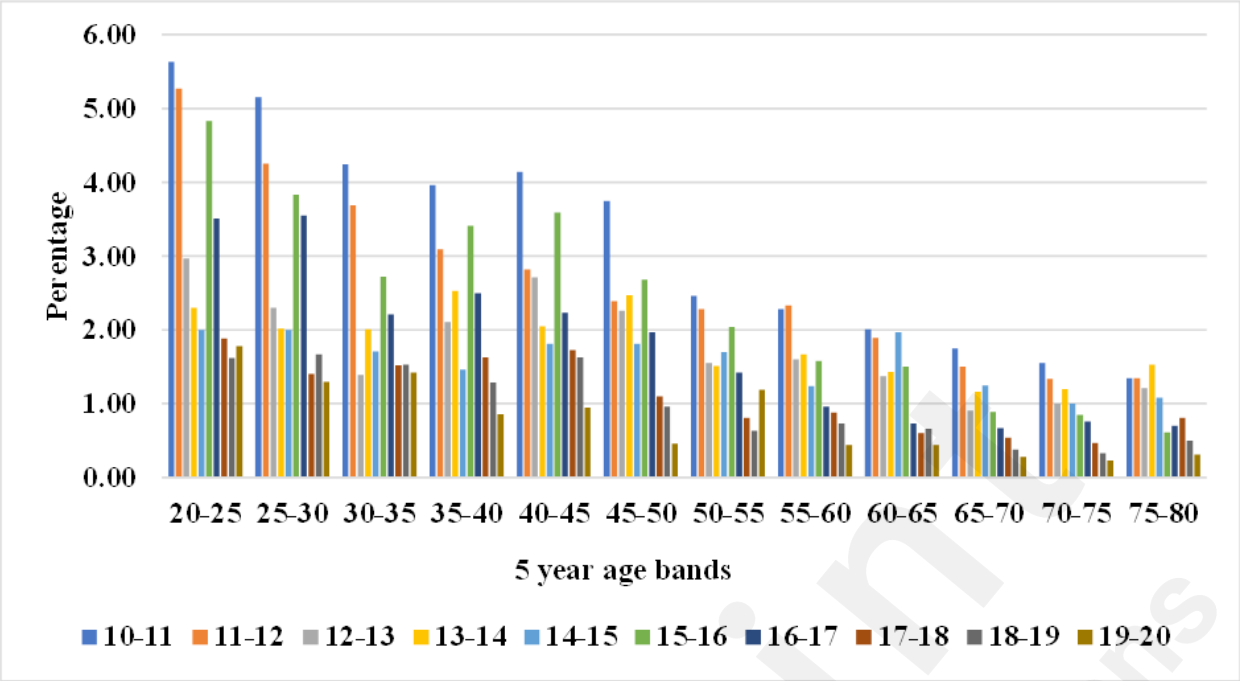
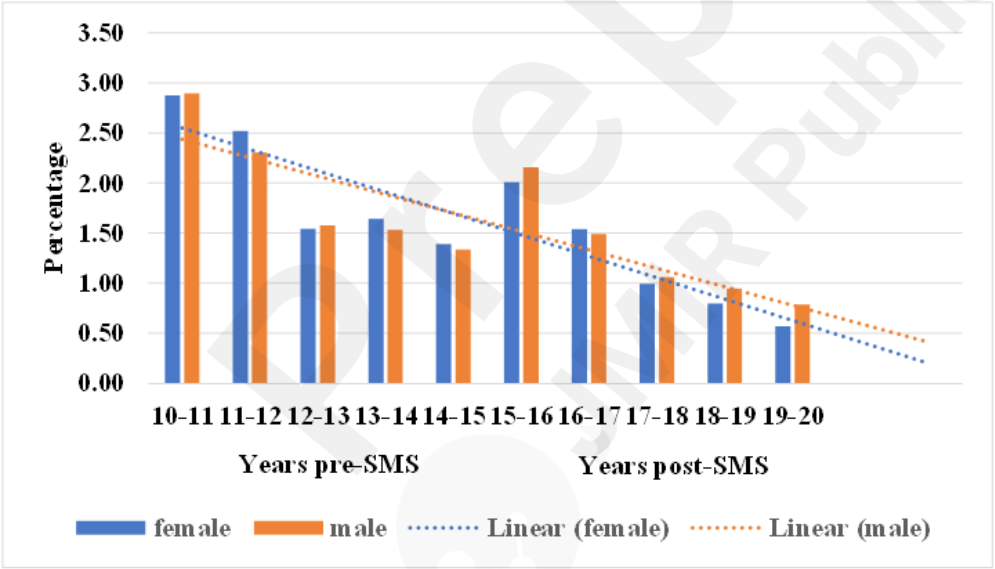


Table 3: Statistical results for 5yr age range (population n=7256, female n=4216, male n = 3040).

	Age range	n (%)	r	Mean	s2	Median
Population						
	20-25yrs	848 (11.7)	1.0	3.2	2.4	2.6
	25-30yrs	832 (11.5)	0.9	2.7	1.8	2.2
	30-35yrs	665 (9.2)	0.7	2.2	1.0	1.9
	35-40yrs	628 (8.7)	1.0	2.3	1.0	2.3
	40-45yrs	734 (10.1)	0.9	2.4	0.9	2.1
	45-50yrs	690 (9.5)	1.0	2.0	0.9	2.1
	50-55yrs	603 (8.3)	0.9	1.6	0.4	1.5
	55-60yrs	564 (7.8)	0.7	1.4	0.4	1.4
	60-65yrs	554 (7.6)	0.6	1.3	0.4	1.4
	65-70yrs	403 (5.6)	0.9	0.9	0.2	0.9
	70-75yrs	358 (4.9)	0.9	0.9	0.2	0.9
	75-80yrs	377 (5.2)	0.1	0.9	0.2	0.9
Female						
	20-25yrs	571 (13.5)	1.0	3.3	2.9	2.8
	25-30yrs	570 (13.5)	0.9	2.7	2	2.3
	30-35yrs	416 (9.9)	0.8	2.2	0.9	1.9
	35-40yrs	322 (7.6)	0.8	2	0.8	1.8
	40-45yrs	401 (9.5)	0.9	2.5	2.5	2
	45-50yrs	406 (9.6)	0.7	2	1	2.3
	50-55yrs	334 (7.9)	0.8	1.5	0.4	1.5
	55-60yrs	300 (7.1)	0.8	1.2	0.4	1.3
	60-65yrs	258 (6.1)	0.3	1	0.3	1.1
	65-70yrs	213 (5.1)	0.9	0.9	0.3	0.9
	70-75yrs	177 (4.2)	0.9	0.8	0.2	0.9

	75-80yrs	248 (5.8)	0.2	1.3	1.5	1.1
Male						
	20-25yrs	277 (9.1)	0.7	3	1.9	2.5
	25-30yrs	262 (8.6)	0.9	2.7	1.8	2.4
	30-35yrs	249 (8.2)	0.5	2.3	1.2	1.7
	35-40yrs	306 (10.1)	0.9	2.8	1.7	2.6
	40-45yrs	333 (11)	0.5	2.5	0.6	2.4
	45-50yrs	284 (9.3)	0.8	1.9	1.1	1.9
	50-55yrs	269 (8.8)	0.9	1.8	0.4	1.8
	55-60yrs	264 (8.7)	0.7	1.5	0.5	1.4
	60-65yrs	296 (9.7)	0.9	1.4	0.5	1.7
	65-70yrs	190 (6.3)	0.9	0.9	0.1	0.8
	70-75yrs	181 (6)	0.9	0.9	0.3	0.9
	75-80yrs	129 (4.2)	0.4	0.8	0.1	0.8

Data analysis showed that text messaging reduced missed appointments at the GP practice. As shown in Figure 2, missed appointments decreased before text messaging was introduced in September 2015. Then increased post-text implementation, followed by a decline to the lowest level in ten years. Several factors may have contributed to this trend, including increased attention and improved data recording practices. Despite this factor, texting resulted in a statistically significant decrease in non-attendance, as evidenced in Table 1. The findings demonstrate text messaging's effectiveness in reducing missed appointments.



Discussion

This research explores the impact of SMS messaging systems on reducing missed appointments in primary care, focusing on a single GP practice. While the study's findings reveal a significant 42.8% decrease in missed appointments post-implementation of text messaging reminders, caution is warranted in generalizing these results to broader healthcare settings. Our 42.8% is significant when compared with the findings of Maslakpak and Safaie [9] who found no significant difference.

Age range analysis revealed interesting findings regarding missed appointments. Surprisingly, the

20-25 age bracket emerged as significant overall, contrary to expectations given their high mobile phone use. De-Sola et al. [16] observed heightened phone use in ages 16-25. However, despite prolific phone usage, the 20-25 range does not exhibit reduced missed appointments. These findings highlight text reminder systems' positive impact on missed appointments overall, yet further exploration is needed to understand factors influencing attendance in specific demographics.

In conclusion, text messaging effectively reduces missed appointments, enabling more GP consultations. However, completely eliminating missed appointments is unlikely. Healthcare technology offers opportunities for further improvement, including timely text reminders and patient data maintenance. By embracing technology in healthcare, challenges can be overcome, appointment availability is maximised, and patient care will be enhanced.

Acknowledgments

The authors thank Prof. Dr. Vic Grout and Bindu Jose (BEng) for their valuable suggestions.

Conflicts of Interest

None declared.

Data Availability

Data is available in Multimedia Appendix 1

Abbreviations

GP: general practitioner

Multimedia Appendix 1

Research data, Kruskal Wallis and Mann Whitney test results contained in Microsoft excel spreadsheet - Mann Whitney test results for DNAs.xlsx.

Figure 1

Percentage of missed appointments in five-year age bands.

Figure 2

Percentage of missed appointments by gender for pre- and post-SMS text messaging with trend lines.

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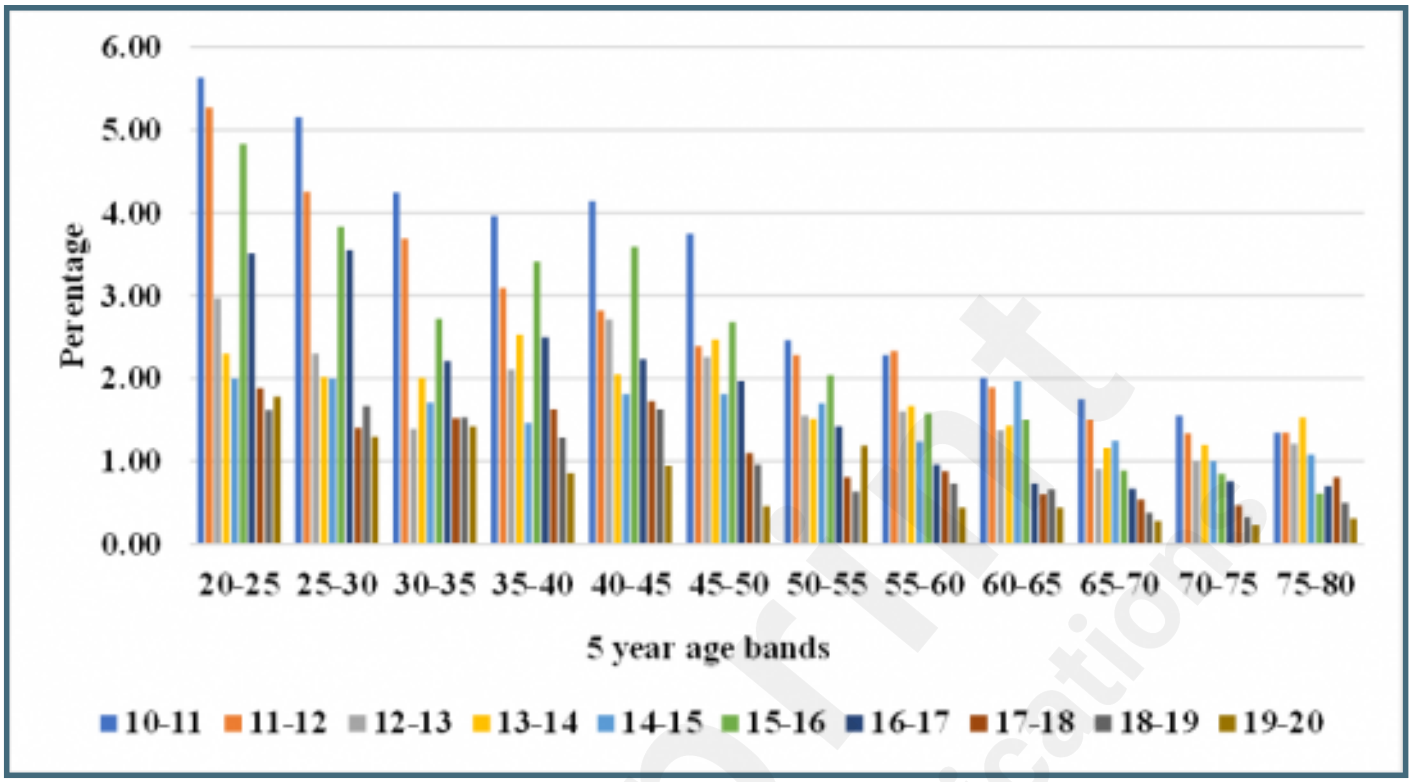
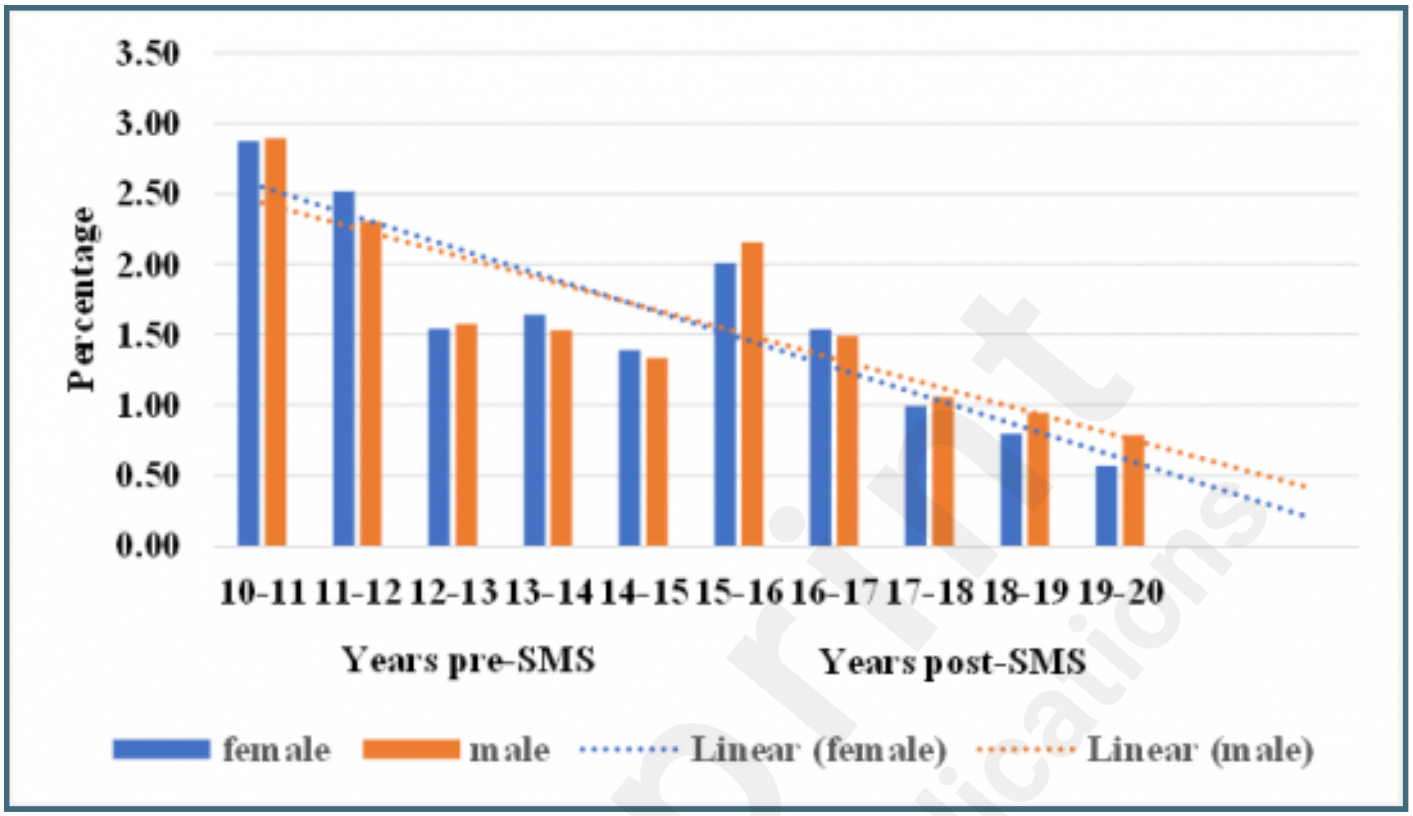
Supplementary Files

Figures

Percentage of missed appointments in five-year age bands.



Percentage of missed appointments by gender for pre- and post-SMS text messaging with trend lines.



Multimedia Appendixes

Study Data, Mann Whitney and Kruskal Wallis test results.
URL: http://asset.jmir.pub/assets/6a84e727c60bab63197232b51811c5ff.xlsx