Leveraging AI-powered Remote Monitoring
to Enhance an NHS Practice Efficiency.

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Abstract

Introduction

This study aims to evaluate the impact of DentalMonitoring (DM) on the efficiency of two types of fixed orthodontics treatments: Fixed-brackets and Carriere Motion.

Methods

This was a retrospective comparative cohort study conducted in a private practice setting and involving a single treating orthodontist.

To achieve the objective of the study, a set of treatment-related predefined metrics were extracted from the clinical notes of the Practice Management Software (PMS) and compared between the DM and non-DM cohorts.

Results

The final number of patients included in the study was 59. For the fixed-bracket group, there were 19 patients in both the DM and non-DM cohorts. In the Carriere Motion group, there were 11 patients in the DM cohort and 10 in the non-DM cohort.

For patients with fixed brackets, the DM cohort experienced a 21.4% reduction in the total number of appointments (5.89 vs. 4.63) over a 300-day treatment period compared to the non-DM cohort. For Carriere Motion patients, the DM cohort had a 37% reduction in the total number of appointments (4.9 vs. 3.09) and a 24% decrease in treatment time (219.90 vs. 167.91 days) compared to the non-DM cohort.

Conclusion

The study's findings suggest that DentalMonitoring can significantly enhance the efficiency of both fixed-bracket and Carriere Motion orthodontic treatments, leading to a notable reduction in the number of appointments, emergencies and potentially the average waiting time for treatment initiation for NHS patients.

Introduction

Orthodontic services in the United Kingdom are facing growing waiting times for both assessments and treatments. This is due to several factors, including a rising population, increased patient demand, and the limited capacity of the National Health Service (NHS) contracted orthodontic provision. Furthermore, geographic challenges in certain regions are exacerbating the

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She is an industry leader in invisible teeth straightening treatments for adults and children. Monica is also registered with the General Dental Council (GDC), is a Fellow of the Royal College of Surgeons of Edinburgh, and is a member of the World Federation of Orthodontists.

Monica is dedicated to orthodontics and continuously trains and develops her staff, including herself. She designs and oversees all bespoke treatment plans for her patients, ensuring that they not only meet their needs but exceed expectations with excellent results.In her spare time, Monica loves spending time with her dogs and, as a qualified pilot, enjoys flying and spending time abroad with her husband, Bennett.

England found that patients waited an average of 4.4 months to begin treatment [2]. Additionally, the average treatment duration was 27 months, requiring around 21 appointments. This inefficiency is attributed to several factors, primarily a lack of treatment visibility and poor patient compliance between appointments. One study indicated that each missed appointment added over a month to the treatment timeline [3]. The study's author suggested that missed appointments might be an indicator of overall patient compliance, as patients who miss appointments are more likely to display other forms of noncompliance, such as failing to wear headgear or elastics and experiencing more frequent appliance breakage.

Regarding treatment efficacy, Zahran et al. reported a mean percentage reduction in PAR scores of 81.5% across the 70 NHS cases evaluated. This improvement is slightly higher than previous studies involving NHS patients, which showed mean PAR reductions ranging from 71.7% to 75.5% [4-5].

These figures suggest that the efficacy of orthodontic treatment for NHS patients is generally satisfactory.

Given the increasing challenges, improving the efficiency and accessibility of orthodontic treatment is more crucial than ever. Enhancements in these areas would enable orthodontists to expand their capacity while reducing waiting times. Additionally, such improvements would provide significant benefits to patients with minimal costs and negligible risks [6].

The aim of this study was to evaluate the impact of DentalMonitoring (DM), an innovative AI-powered remote monitoring software, on the efficiency of two types of fixed appliances: Fixed-brackets and Carriere Motion appliances.

Materials & Methods

Study Design

This was a retrospective comparative cohort study in a private practice setting involving a single treating orthodontist.

The aim of this study was to assess the impact of DM on treatment efficiency with braces and Carriere motion appliances.

To achieve this objective, a set of treatment-related predefined metrics was extracted from the clinical notes of the Practice Management Software (PMS) and compared between the DM and non-DM cohorts.

Subjects Selection Criteria

The study focused on NHS patients treated with braces and Carriere motion. The inclusion and exclusion criteria for all the study subjects are detailed below:

- Teens with complete 6-6 dentition
- Non-surgical cases
- Non-extraction cases

For the DM cohorts, additional selection criteria were applied:

- Patients with inconsistent scanning were excluded from the analysis for both treatment types.

The Data Extraction

Following the selection of study subjects to constitute the cohorts equitably, a PMS data extraction was performed for all

the subjects to obtain the following parameters:

- Total number of appointments
- Adjustment appointments
- Emergency appointments
- Date of treatment start
- Date of treatment end
- Patients' date of birth
- Patients' age at the date of treatment start
- Gender

For the braces DM cohort, treatments were not finalized since DM was implemented in the practice in August 2023. Consequently, the DM cohort for braces had an average treatment duration of 300 days (±10 days). To ensure a fair comparison between the two cohorts, a cut-off period of 300 days (±10 days) was established for the non-DM cohort, all of whom had completed their treatment. Therefore, the data comparison between the two cohorts was conducted over the first 300 (±10 days days of treatment.

Results

Braces cohorts

For the braces patients, the initial cohorts encompassed 43 patients (23 DM and 19 non-DM). 5 patients were excluded from the analysis (4 DM and 1 non-DM) resulting in the final number of subjects being 38 (19 DM and 19 non-DM).

The reasons for extraction were the following:

- One was an extraction case
- One had a parafunction (onychophagia) which resulted in an abnormal number of emergencies
- The 3 others were over the age of 18 at the time of treatment start

The number of oral hygiene sessions scheduled was significantly different between the 2 groups, with group B necessitating 40.4% more hygiene visits. *(Table 4)*

Patient group	Total Number of patients	Av. App per patient	Av. Adjustment visits per patient	Av. Emergencies per patient
Control	19	5.89	3.00	1.00
DM	19	4.63	2.37	0.95

Table 1 - Treatment metrics comparison for braces patients

Descriptive statistics for all selected subjects who were included in the final analysis were performed for age and gender (Table 2).

Characteristic	Number (%)
Gender	
Male	13 (34%)
Female	25 (66%)
Age group	
]10 - 13]	10 (26%)
]13 - 16]	20 (53%)
]16 - 18]	8 (21%)

Table 2 - Demographic characteristics of the braces cohorts

Carriere motion cohorts

For the Carriere motion patients, the cohorts encompassed 21 patients (11 DM and 10 non-DM). No exclusion were made.

The final results for the treatment efficiency metrics comparison are presented in the table below.

Patient group	Total Number of patients	Av. Treatment duration	Av. Adjustment visits per patient	Av. Emergencies per patient	Av. emergencies per patient
Control	10	219.90	4.9	1.4	1.5
DM	11	167.91	3.09	0.18	0.73

Table 3 - Treatment metrics comparison for Carriere motion patients

Descriptive statistics for all selected subjects who were included in the final analysis were performed for age and gender (Table 4)

Characteristic	Number (%)
Gender	
Male	10 (48%)
Female	11 (52%)
Age group	
]12 - 14]	13 (62%)
]14 - 16]	6 (28%)
]16 - 17]	2 (10%)

Table 4 - Demographic characteristics of the braces cohorts

Discussion

This study found a higher number of emergencies detected in the This retrospective study aimed to evaluate the impact of DM on fixed-bracket and Carriere motion treatment efficiency by comparing a set of predefined metrics.

The results reveal a clear pattern: patients monitored with DM demonstrated significant improvements across all efficiency metrics. For patients with fixed-brackets, the DM group experienced a 21.4% reduction in the total number of appointments. In the Carriere Motion group, DM led to a 24% decrease in treatment time and a 37% reduction in the total number of appointments. The substantial decrease in appointments for Carriere Motion patients can be attributed to two main factors: First, the DM system enabled most patients to avoid adjustment appointments by notifying me when Class I was achieved. Second, the incidence of treatment-related emergencies was reduced by almost 50%.

This improvement in treatment efficiency has resulted in considerable time savings for my practice. For context, among the 38 fixed-bracket patients in this study, the non-DM cohort had a total of 112 appointments, whereas the DM cohort had only 88 appointments over a 300-day period. This translates to 834 appointments saved for my 660 NHS fixed-bracket patients during the same timeframe.

As a result of this increased efficiency, the average waiting time for assessment and treatment has decreased from 14 weeks prior to implementing DentalMonitoring (DM) to just 3 weeks today. This represents a substantial improvement compared to the national average of 4.4 months for other NHS providers. The enhanced treatment efficiency not only benefits my practice but also greatly improves the patient experience. Fewer unnecessary office visits mean less time away from school and extracurricular

activities for teens, and reduced time off work for parents who otherwise would spend significant time commuting and waiting. Additionally, most of my patients have reported a positive experience with DM, which appears to significantly boost their compliance and overall satisfaction with their treatment.

Finally, the staff is a critical component influencing the overall health of the practice and cannot be overlooked. Initially, there was some hesitation from the staff when DM was implemented, as they feared it might lead to job losses. However, they soon realized that DM was not a threat but a tool that significantly improved their work-life balance. The optimization of practice operations led to more predictable schedules and fewer unexpected emergencies. Moreover, much of the saved chair time was offset by screen time for managing patients via DM, allowing for more flexible working hours. Some staff members even had the opportunity to work remotely on certain days, further enhancing their work-life balance.

As AI-powered remote monitoring becomes the prevailing standard of care in orthodontics, future research endeavors should further explore the ramifications of this innovative approach on patient care quality, experience, and treatment efficiency with various types of appliances.

Conclusions

The main findings of this study indicate that DM can significantly improve the efficiency of both fixed-bracket and Carriere Motion orthodontic treatments. For braces treatments, DM resulted in a reduction in both the total number of visits and adjustment visits. In the case of Carriere Motion treatments, DM led to decreases in the total number of visits, adjustment visits, emergencies, and treatment time.

As a result of this enhanced efficiency, DM can contribute to substantially reduce the average waiting time for assessment and treatment of NHS orthodontic patients as well as.

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