

Development of a Tool to Assess Adherence in Adult Patients Undergoing Orthodontic Treatment

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Abstract

Introduction: Although ensuring adherence to orthodontic treatment among adult patients is challenging, orthodontists rarely or only poorly record patient adherence.

Aim: Here, we developed a patient adherence tool and evaluated orthodontists' attitudes toward it and as its actual use in clinical practice.

Materials and Methods: Thirty-six orthodontists in a London teaching dental hospital used the tool in daily clinical practice to record patient adherence. The orthodontists provided self-report regarding the tool's usability and applicability, and we assessed their actual adherence to using the tool.

Results: All orthodontists provided positive feedback about the tool, stating that it was useful, efficient, good in its current form, and suitable for documenting patient adherence. Nearly 70% of the orthodontists also stated that they would use the tool in their daily clinical practice. However, their behavior contrasted with their self-reported positive attitudes. Although initial adherence to the tool was 89.3%, its use during follow-up visits for the same patient was low (11%).

Conclusion: The orthodontists in this study reported positive attitudes toward the use of the developed patient adherence tool, and thus, it can be a promising tool for monitoring adherence to orthodontic treatment in adult patients. However, its routine use in daily clinical practice needs to be carefully implemented and supported.

Keywords: Orthodontic treatment; Adherence tool; Compliance; Adults

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Introduction

Patients' nonadherence to health care instructions is a well-researched topic. A search of the bibliographic database PubMed in June 2019 revealed more than 126,000 research papers published on this subject. With this many research articles, it is natural to assume that the question of what makes people adhere to medical treatment would have been answered. However, the combination of patient behaviors that predict adherence remains elusive.

In dentistry, patient adherence can take several forms. From asking patients to follow through with oral hygiene instructions to using orthodontic appliances in a particular manner, patients are expected to adhere to a range of simple and more complex

behaviors [1]. Orthodontics is a particularly good vehicle for studying adherence. Here, patients are expected to follow through with a range of behaviors to complete their treatment [2]. Factors such as age, sex, perceptions of malocclusion, personality type, and socioeconomic and demographic characteristics have all been found to moderate patient adherence in this field. In addition, studies that have explicitly examined adherence to orthodontic appliance wear (e.g., use of headgear and rubber bands) have shown significant variations in patient adherence levels [3].

Overall, most previous studies examining orthodontists' attitudes toward patient adherence have reported that orthodontists see patient attendance, oral hygiene, and the extent of breakage of appliances as reliable indicators of patient adherence. Moreover, patients who attend appointments regularly, have good oral

hygiene, and have few broken appliances are thus generally considered as “compliant” or “adherent” with treatment [4-7].

Because adherence is important for treatment completion, clinicians would be expected to have reliable ways of recording patient adherence levels in their case notes so that they could tackle nonadherence if and when it arises. However, that is not the case. In an earlier study examining the extent to which nonadherence was recorded in patient notes, our team found substantial variability in how and whether adherence behaviors were ever recorded in notes [8]. This is a classic case of the attitude–behavior gap that underpins a lot of human behaviors [9]. Although orthodontists widely report a positive attitude about the importance of patient adherence in supporting treatment success in orthodontics, their actual behavior (i.e., reliably recording nonadherence in case notes so that they might address it) does not match their attitude [8].

In this study, we hypothesized that developing a simple tool for orthodontists to use in recording and assessing adherence in a uniform manner may improve the reliable recording of patient adherence in this field. Our previous work [7,8] and other literature showed that adherence is perceived as patients attending appointments, maintaining good oral hygiene, wearing elastics or functional appliances as instructed, and avoiding foods that commonly loosen the brackets [4-6]. Thus, we created a simple patient adherence tool consisting of the three most frequently reported adherence indicators (attendance, oral hygiene, and breakage of appliances). We then assessed orthodontists’ attitudes toward the tool and their actual behavior (i.e., their actual adherence to using the tool in practice).

We hypothesized that orthodontists would have positive attitudes toward a simple tool for recording adherence. However, in line with work on the attitude–behavior gap, our second hypothesis was that their compliance with using the tool would be less positive than their attitudes would indicate.

Materials and Methods

Participants

Study participants consisted of orthodontists (postgraduate orthodontists, consultants, and staff grades) who were providing care to adult patients at a large teaching dental hospital in London. The inclusion criteria included fluency in English and willingness to use the patient adherence tool in daily clinical practice during the study period (16 weeks). The lower age limit was 18 years, and there was no upper limit. Of the 39 orthodontists approached (27 postgraduate orthodontists, 5 consultants, and 7 staff grades), 36 (92.3%) agreed to participate in the study. Of these, 21 provided demographic information. These participants included 11 women and 10 men with a mean age of 31 years (SD=2.8 years; age range, 25–38 years).

Materials

We used the literature as the basis of the adherence tool (**Figure 1**), with advice from five consultant orthodontists and with brevity in mind. The tool consisted of questions about gingivitis,

patient attendance, and the breakage of appliances (including broken wires and loose bands). A red, amber, and green alarm system was used to highlight potential non-adherent patients. Specifically, the tool invited the orthodontist to select options for patient attendance (attended on time, attended ≥ 15 min late, or did not attend), gingivitis (none, gingivitis around $<50\%$ of teeth, or gingivitis around $>50\%$ of teeth), and evidence of broken appliances, distorted wires, and/or loose bands.

We developed a feedback questionnaire for clinicians to provide a self-report of the patient adherence tool’s usability and applicability and to determine whether they would consider using such a tool in their daily practice. The questionnaire included six items, and the responses were assessed using a four-point Likert-type scale (ranging from strongly agree to strongly disagree). The items considered the ease of use of and time required to use the patient adherence tool as well as its suitability for recording patient adherence, its adequacy in its current form, and orthodontists’ intention to use it in their daily clinical practice. In the second part of the questionnaire, orthodontists were invited to provide comments and suggestions for improvements (**Figure 2**).

Procedure

Potential participants were initially approached via e-mail sent by the NHS lead consultant, who informed the orthodontists about the research. The researcher then met with the potential sample to provide further information about the study. Potential participants were informed that they would have to use the tool anonymously with at least five adult patients each for a maximum of three visits. The orthodontists were also informed that the tool would be attached to the patients’ case notes by the nurses and that its completion would imply their consent. They were also informed that they would be asked to complete a feedback questionnaire at the end of the study. Nurses (n=17) supporting the orthodontists agreed to help in administering the tool by including it in orthodontists’ adult case notes. Nurses were given £20 Amazon vouchers for their assistance. The study received ethics clearance from the host academic institution (LRS-15/16-2592).

Care coordination

During the study care manager have their usual routine duties with no interventions. They are responsible for all the administrative duties in the orthodontic setting, they schedule patient appointments and help to manage the patient follow-up appointments with the orthodontists based on the patients’ appointments’ schedule and individual patient’s needs [10-13].

Data analysis

The feedback questionnaire included both positively and negatively worded questions. Reverse scoring was used for some items such that a higher total score indicated a more positive attitude toward using the patient adherence tool. We calculated actual compliance using the number of returned patient adherence tools and questionnaires per the total number of distributed documents. The study was conducted over a duration of 16 weeks, enabling the adherence of the same patient to be



Adherence Checklist

Clinician's ID _____
 Age _____
 Gender _____
 Qualification _____
 Patient ID _____
 DOB _____

For each of the factors below please tick the box that applies in either the **green**, **amber** or **red** column

		Green	Amber	Red	Total – if 2 or more amber or red ticks, alert non-adherence
Date					
Visit 1	Attendance	Attended on time <input type="radio"/>	Attended late ≥ 15 minutes <input type="radio"/>	DNA <input type="radio"/>	
	Gingivitis	No <input type="radio"/>	Gingivitis around < 50% teeth <input type="radio"/>	Gingivitis around > 50% teeth <input type="radio"/>	
	Broken appliances / distorted wires / loose bands	No <input type="radio"/>	Yes – single issue <input type="radio"/>	Yes – multiple issues <input type="radio"/>	
Date					
Visit 2	Attendance	Attended on time <input type="radio"/>	Attended late ≥ 15 minutes <input type="radio"/>	DNA <input type="radio"/>	
	Gingivitis	No <input type="radio"/>	Gingivitis around < 50% teeth <input type="radio"/>	Gingivitis around > 50% teeth <input type="radio"/>	
	Broken appliances / distorted wires / loose bands	No <input type="radio"/>	Yes – single issue <input type="radio"/>	Yes – multiple issues <input type="radio"/>	
Date					
Visit 3	Attendance	Attended on time <input type="radio"/>	Attended late ≥ 15 minutes <input type="radio"/>	DNA <input type="radio"/>	
	Gingivitis	No <input type="radio"/>	Gingivitis around < 50% teeth <input type="radio"/>	Gingivitis around > 50% teeth <input type="radio"/>	
	Broken appliances / distorted wires / loose bands	No <input type="radio"/>	Yes – single issue <input type="radio"/>	Yes – multiple issues <input type="radio"/>	

Figure 1 Adherence tool.

recorded three times, considering an interval of four to five weeks between visits. Therefore, in addition to the initial compliance, we determined how persistent the orthodontists were in using the patient adherence tool during the course of the study (full compliance). In this regard, absolute full compliance was defined as the use of the patient adherence tool during each of the patient's three follow-up visits during the study period.

Results

Attitudes toward using the adherence tool

Of the 36 orthodontists who agreed to participate in the study, 5 left the organization before completing the study course, and hence, they did not complete the feedback questionnaire. Two orthodontists could not be contacted for completion of

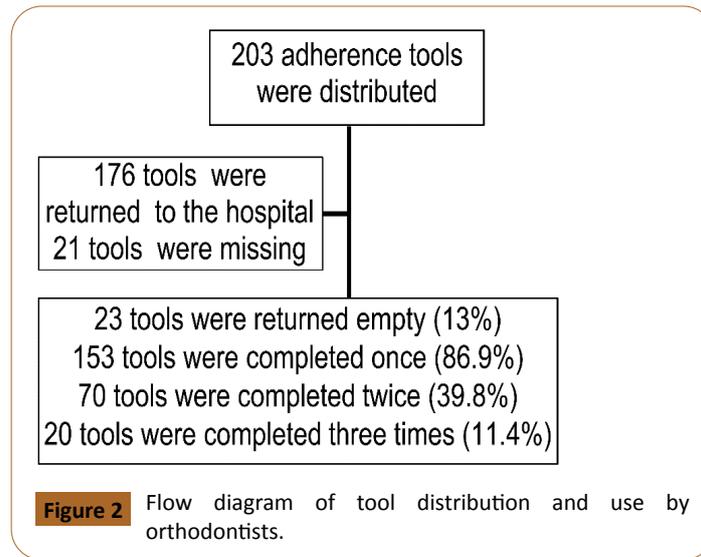


Table 1 Frequencies and percentages of orthodontists’ responses to each of the questions in the feedback questionnaire.

Variables	All agree (agree + strongly agree)	All disagree (disagree + strongly disagree)	Strongly agree	Agree	Disagree	Strongly disagree
1. The tool was easy to use	100.0% 28	0% 0	46.4% 13	53.6% 15	0.0% 0	0.0% 0
2. The tool was burdensome/took a long time to use	3.4% 1	96.6% 28	3.4% 1	0.0% 0	62.1% 18	34.5% 10
3. The tool is good as it stands	96.6% 28	3.4% 1	20.7% 6	75.9% 22	3.4% 1	0.0% 0
4. I would not use the tool in my daily practice	31.0% 9	69% 20	3.4% 1	27.6% 8	69.0% 20	0.0% 0
5. The tool is adequate for recording patients’ adherence to treatment	89.7% 26	10.3% 3	17.2% 5	72.4% 21	10.3% 3	0.0% 0
6. The tool would benefit from some revision	34.5% 10	65.5% 19	3.4% 1	31.0% 9	62.1% 18	3.4% 1

the feedback questionnaire. Therefore, a total of 29 feedback questionnaires were completed and returned. The orthodontists provided overall positive feedback regarding the use of the patient adherence tool. **Table 1** shows the orthodontists’ responses on the feedback questionnaire.

All orthodontists, except for one who skipped the question, stated that the patient adherence tool was easy to use. All but one orthodontist agreed that the tool was good in its current form and that it was not burdensome/time-consuming ($\chi^2=25.38$, $df=1$, $p<0.001$). Approximately 70% of orthodontists indicated that they would use this tool in daily clinical practice ($\chi^2=4.17$, $df=1$, $p<0.04$). Approximately 90% of the orthodontists agreed that the patient adherence tool was adequate for recording patient adherence ($\chi^2=18.24$, $df=1$, $p<0.001$). There was no consensus between respondents on whether the patient adherence tool would benefit from revision ($\chi^2=2.79$, $df=1$, $p<0.095$).

One of the suggested improvements was that “wearing elastics” should be included as an indicator of adherence. Another suggestion was that the nurses/receptionists should record whether the patient arrived on time (to prevent orthodontists from reporting that the patient arrived late when the actual

reason was unrelated to patient adherence, e.g., double-booking/overlap between schedules for two patients).

Orthodontists’ adherence to using the tool

A total of 203 patient adherence tools were distributed to the orthodontists who agreed to participate, and the tools were included in the patient case notes. Of these, 176 patient adherence tools were returned, whereas the remaining 21 were missing from the case notes, indicating an initial compliance of 89.3%. Of the 176 returned patient adherence tools, 23 (13.1%) were not completed. Twenty (11.4%) contained records of three patient visits as per instructions. Seventy (39.8%) had been carried out on two consecutive patient visits, whereas most of the tools (153 or 86.9%) had been administered at a single patient visit.

Discussion

This study aimed to evaluate orthodontists’ attitudes and actual behavior toward the use of a simple tool for recording patient adherence in the orthodontic setting. Although consensus among the sample indicated a positive attitude toward the tool (i.e., that the tool was useful, not time-consuming, and was suitable for

recording patient adherence), these attitudes did not translate into daily clinical practice. Although nearly 90% of the sample complied with study instructions to use the tool with a patient at the first visit, we observed only 11% full compliance (in which the patient adherence tool was applied during each of three follow-up visits for the same patient). This is a clear case of an attitude–behavior gap, in which our orthodontists reported a positive attitude but acted differently in practice.

When using such a tool, there are several reasons for low compliance, including lack of motivation to change, lack of outcome expectancy, and external barriers such as lack of resources, time constraints, and the absence of a reminder system. Future research may reasonably explore the reasons why orthodontists had such low compliance with using a brief patient adherence tool.

The present study had some limitations. It was conducted at a National Health Service hospital in London, and the results may not be generalizable to other settings. Although the tool has not been evaluated in private practice, it may well be that it is better suited for situations in which clinicians perceive fewer time pressures during the consultations.

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Conclusion

In this study of a newly developed tool for measuring patient adherence in orthodontic settings, clinicians demonstrated a classic attitude–behavior gap, in which they reported exceedingly positive attitudes toward the tool but demonstrated low compliance with using it. The introduction of indicators of adherence in routine clinical practice needs to be further investigated so that such attitude–behavior gaps may close.

Authors' Contributions

All authors conceived of the original idea and supervised the project. Nawaf carried out the project; he was a major contributor in analyzing, interpreting data and writing the manuscript with support from Asimakopoulou and Tim. All authors read and approved the final manuscript.

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