

COMPARING THE EFFICACY OF SMARTPHONE ORTHODONTIC APPLICATION AND CONVENTIONAL ORTHODONTIC PRACTICE MANAGEMENT SOFTWARE IN TELANGANA

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ABSTRACT

The use of smartphones has enabled the clinicians to find apps for their own use facilitate meaningful conversations with their patients and simplify the patient record management. Orthodontic apps make smartphones useful tools in the practice of evidence-based medicine at the point of care in addition to their use in mobile clinical communication. The ability to download custom-built software applications (apps) has created new opportunities for orthodontists to integrate technology into clinical practice and patients to collect the information about orthodontics and help them during their treatment.

Material and Method:

Fifty orthodontists were selected from Telangana population and were distributed with “SaralDent 4.5” practice management software for the computer and “ADC Ortho” a custom-built application for Smartphone. In the present study we have selected patients requiring orthodontic treatment while maintaining good oral hygiene practices. They were subjected to comparison between the use of “ADC Ortho” Smartphone app and “SaralDent 4.5” computer software.

Results:

In this study, Mean and standard deviation of all the ratings by orthodontists for SaralDent and ADC Ortho were compared. Out of the ten questions asked ADC Ortho app was found to be better than SaralDent software in five aspects. SaralDent was better than ADC Ortho in three aspects. We have used Mann Whitney U test, and test values for Overall Experience on using SaralDent and ADC Ortho were 3.6 ± 0.49 (4.0) and 3.7 ± 0.65 (4.0) respectively, with ‘U’ value 1175.0 and ‘P’ value 0.6022 which shows it is not significant.

Conclusion:

This study illustrates many of the technical qualities of Smartphones and are highlighted by their direct comparison with those of Computer in Orthodontic practice management as the platform for the app and software are different. Applications are on the rise, with many clinicians and allied health workers already adopting smartphones However, the extent to which Smartphones provide benefits due to their mobility has been significantly under investigated.

Keywords: Oral hygiene, Orthodontic app, Saraldent, Practice management, Electronic dental record.

INTRODUCTION

Traditionally, the practicing dentist has had to act as bookkeeper, accountant, marketing and promotions expert and in countless other capacities in addition to clinician. The profession has always had its innate challenges if any measure of success was to be achieved. Practice management has been consistently identified as a major factor. Fortunately, technological advances have alleviated much of the strain.¹⁸

Computers made their way into the dental office as an accounts receivable device as early as the late 1960s. Later the term "computer based dental documentation" was replaced with the term "electronic patient record (EPR)" since the last better describes the method and the environment in which the patient record is being managed.²⁴

The advantages of using a computer in an orthodontic practice are evident for many applications, such as digitizing x-rays, collecting measurements, modeling patient growth, storing clinical photographs and much more. For many dental practices today, practice management (PM) software programs are essential to organize the records of the patients in their practice. Most dental practices already have PRACTICE MANAGEMENT software a survey conducted in 2010 by the California Healthcare Foundation found that 93% of respondents use it. However, according to a 2006 survey on use of technology in the operatory, i.e., clinical computing, only about one-fourth (24.6%) of general dentists were using computers chairside.²⁵

Many windows operating system based orthodontic practice management softwares like Dento-Soft, Dentrax, Pappy Joe, OrthoBuddy, Practo, SaralDent, etc are available in the market which have higher levels of satisfaction among users for its features but carrying all of this patient data, especially for orthodontists who are on visiting basis in many clinics and hospitals face a kind of hassle to carry the patient records.

The increasing use of technology is rapidly changing our personal and professional lives. The existence of smartphones can be traced as early as 1992, then in 1993, IBM launched the Simon, a touch screen phone with integrated email, fax, calendar, and notepad; it was not until nearly 10 years later development of the Palm and Blackberry in 2001 and 2002, respectively, that consumers began to use mobile devices capable of wireless information services and web browsing.⁹ Release of the iPhone and Android based smartphones included features not found on previous devices and led the way for developers to create a library of apps available to consumers.⁹

MATERIALS AND METHOD

SOURCE OF DATA:

Fifty orthodontists were selected from the Telangana population and were distributed with "SaralDent 4.5" practice management software for the computer and "ADC Ortho" an android based mobile application or app for Smartphone to use for a period of 1 year.

A comprehensive questionnaire with sixteen questions was designed to collect information on orthodontic practice management.

SELECTION CRITERIA

INCLUSION CRITERIA-

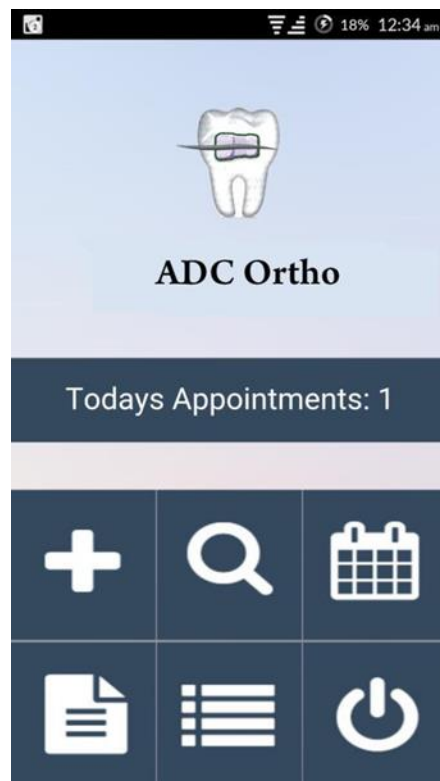
- Orthodontists were selected from Telangana.
- Orthodontists having a practice experience of 5 years, or more were selected.
- Orthodontists having a compatible 3G enabled mobile phone.
- Orthodontists having an Android based operating system with an Android 4.1 or a higher version on their smartphones.
- Windows based operating system for the computer with a minimum version of XP/Vista/win 7/win eight.
- Patients maintaining good oral hygiene practices and malocclusion.

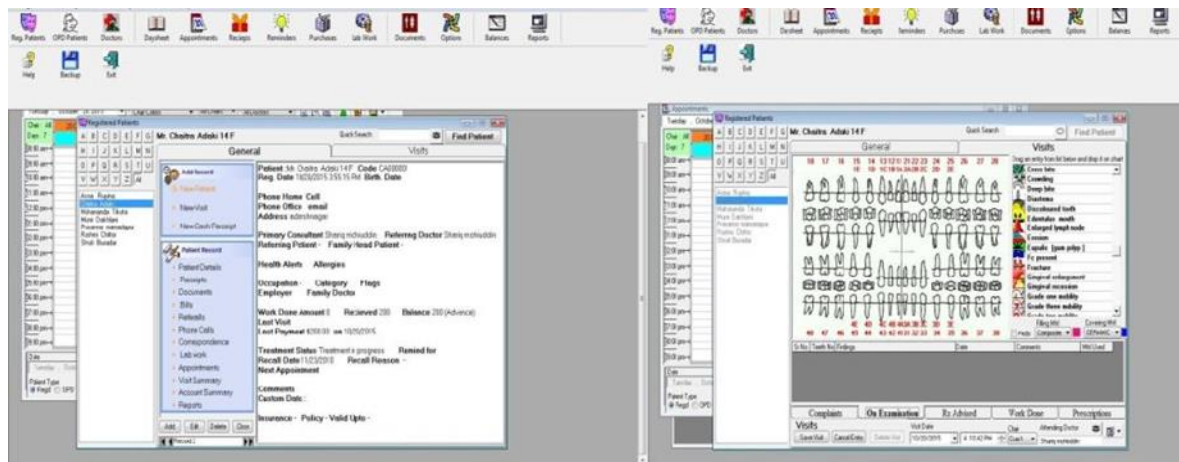
EXCLUSION CRITERIA-

- Orthodontists having a practice experience of less than 5 years.
- Orthodontists having smartphones based on Android operating system with versions lesser than Android 4.1
- Orthodontists having smartphones based on operating systems other than Android operating system.
- Computer installed with operating system other than Windows.
- Patients having periodontally compromised dentition and grade III mobility.

Programs used in the study.

SaralDent 4.5 software on Windows operating system ADC Ortho application on Android based Smartphone.





We have developed an app to organize the Orthodontic Practice. This app, called ADC Ortho, runs on Android-based smartphones. We have included the features such as Storing of Patient details, Storing of X-ray images, Generating Comprehensive reports, Model Analysis, Treatment History Etc.

Questionnaire

THANK YOU FOR TAKING THE TIME TO FILL IN THIS QUESTIONNAIRE, WHICH WILL BE USED FOR A RESEARCH PROJECT

"Please tick (✓) wherever appropriate"

1) Name:-

2) Age:-

3) Office Address:-

4) Where do you practice:-

Academic Institution Govt. Hospital or Center Full time Private Part time private

5) Work Experience:-

5 Years >10 Years <10 Years

6) Earlier, have you been using any software for orthodontic practice management?

Yes, Please Specify _____

No

THE FOLLOWING QUESTIONS RELATE TO YOUR VIEWS ON USING THE PROGRAMS "SARALDENT" SOFTWARE AND "ADC ORTHO" MOBILE APP PLEASE RATE THE FOLLOWING QUESTIONS ON THE SCALE OF 1 TO 5 WHERE 1= POOR, 2 = FAIR, 3 = GOOD, 4= VERY GOOD, 5 = EXCELLENT

7) In visiting orthodontics for practice management?

	1	2	3	4	5		1	2	3	4	5
SARALDENT Software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ADC Ortho	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8) Image capture or importing of images (photographs/radiographs)?

	1	2	3	4	5		1	2	3	4	5
SARALDENT Software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ADC Ortho	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9) Response time?

	1	2	3	4	5		1	2	3	4	5
SARALDENT Software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ADC Ortho	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10) User Interface?

	1	2	3	4	5		1	2	3	4	5
SARALDENT Software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ADC Ortho	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11) Compatibility with other operating system or softwares?

	1	2	3	4	5		1	2	3	4	5
SARALDENT Software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ADC Ortho	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12) Appointment scheduling feature?

	1	2	3	4	5		1	2	3	4	5
SARALDENT Software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ADC Ortho	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13) Reminder Service?

	1	2	3	4	5		1	2	3	4	5
SARALDENT Software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ADC Ortho	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14) Billing and collection reports?

	1	2	3	4	5		1	2	3	4	5
SARALDENT Software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ADC Ortho	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15) Backup of the patient data records?

	1	2	3	4	5		1	2	3	4	5
SARALDENT Software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ADC Ortho	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16) How was your overall experience?

	1	2	3	4	5		1	2	3	4	5
SARALDENT Software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ADC Ortho	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Suggestions/Comments:-

My Signature below means that I have been informed about the study and have been assured the details of this study will be kept confidential. I voluntary consent to participate in study.

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Orthodontist's Signature

How likely are you to recommend ADC Ortho or SaralDent to others?

SARALDENT Software	ADC Ortho
<input type="checkbox"/> Very likely	<input type="checkbox"/> Very likely
<input type="checkbox"/> Somewhat likely	<input type="checkbox"/> Somewhat likely
<input type="checkbox"/> Neutral	<input type="checkbox"/> Neutral
<input type="checkbox"/> Somewhat unlikely	<input type="checkbox"/> Somewhat unlikely
<input type="checkbox"/> Very Unlikely	<input type="checkbox"/> Very Unlikely

Method of Statistical Analysis:

The statistical methods used in this study include the mean, standard deviation, and the Mann-Whitney U-test. The mean, denoted as \bar{x} , is calculated by summing all observations and dividing by the number of observations (n). Standard deviation (SD) measures variability by calculating the square root of the mean of the squared deviations from the mean. For small samples (n < 30), the SD formula uses (n-1) in the denominator, while for larger samples (n > 30), the traditional formula is used. The Mann-Whitney U-test, a non-parametric test, is employed to compare whether two independent groups come from the same population, serving as an alternative to the t-test for ordinal data.

RESULT

STATISTICAL ANALYSIS

The Orthodontists were asked to Rate the Questions related to the programs “Saraldent” software and “ADC Ortho” mobile app on the scale of 1 to 5, where 1 = poor, 2 = fair, 3 = good, 4 = very good, 5 = excellent.

Mean and standard deviation of all the ratings by orthodontists are shown in Table 1, Table 2, and Graph 1, Graph 2 for SaralDent software and ADC Ortho app.

To Compare the Mean values of SaralDent and ADC Ortho MANN WHITNEY UTEST was used.

Table 1: Mean Values of SaralDent Software

SaralDent	MEAN±SD(MEDIAN)
Question 1 (visiting orthodontics)	2.1±0.95(2.0)
Question 2 (Image capture)	3.5±0.51(3.5)
Question 3(Response time)	4.1±1.71(4.0)
Question 4(User Interface)	2.8±0.88(2.5)
Question 5(Compatibility with other OS)	3.5±0.51(3.5)
Question 6(Appointment scheduling)	3.4±0.81(3.0)
Question 7(Reminder Service)	3.4±0.49(3.0)
Question 8(Billing and collection reports)	3.7±0.79(3.5)
Question 9(Backup)	4.0±0.78(4.0)
Question 10(Overall Experience)	3.6±0.49(4.0)

Figure 2: Mean Values of ADC Ortho App

ADC Ortho	MEAN±SD(MEDIAN)
Question 1 (visiting orthodontics)	4.2±0.40(4.0)
Question 2 (Image capture)	3.8±1.3(4.0)
Question 3(Response time)	2.9±0.84(3.0)
Question 4(User Interface)	3.6±0.49(4.0)
Question 5(Compatibility with other OS)	3.0±.78(3.0)
Question 6(Appointment scheduling)	3.9±0.54(4.0)
Question 7(Reminder Service)	4.4±0.67(4.5)
Question 8(Billing and collection reports)	3.6±0.67(4.0)
Question 9(Backup)	3.6±0.49(4.0)
Question 10(Overall Experience)	3.7±0.65(4.0)

Table 3: Comparison b/w SaralDent& ADC Ortho

QUESTIONS	SARAL MEAN±SD(MEDIAN)	ADC MEAN±SD(MEDIAN)	STATISTICAL TEST MANN WHITNEY U TEST		REMARK
Question 1 (visiting orthodontics)	2.1±0.95(2.0)	4.2±0.40(4.0)	U=100	P<0.001	HS
Question 2(Image capture)	3.5±0.51(3.5)	3.8±1.3(4.0)	U=937.50	P=0.0307	Significant
Question 3(Response time)	4.1±1.71(4.0)	2.9±0.84(3.0)	U=412.50	P<0.0001	HS
Question 4(User Interface)	2.8±0.88(2.5)	3.6±0.49(4.0)	U=625.0	P<0.0001	HS
Question 5(Compatibility with other OS)	3.5±0.51(3.5)	3.0±.78(3.0)	U=812.60	P<0.05	Significant
Question 6(Appointment scheduling)	3.4±0.81(3.0)	3.9±0.54(4.0)	U=775.0	P<0.05	Significant
Question 7(Reminder Service)	3.4±0.49(3.0)	4.4±0.67(4.5)	U=375.0	P<0.0001	HS
Question 8(Billing and collection reports)	3.7±0.79(3.5)	3.6±0.67(4.0)	U=1237.0	P=0.9333	NS
Question 9(Backup)	4.0±0.78(4.0)	3.6±0.49(4.0)	U=900.0	P<0.05	Significant
Question 10(Overall Experience)	3.6±0.49(4.0)	3.7±0.65(4.0)	U=1175.0	P=0.6022	NS

DISCUSSION

In the present study we have compared the use and efficacy of “ADC Ortho” a custom-built Smartphone app and “SaralDent 4.5” computer software in orthodontic practice management by a questionnaire survey. ADC Ortho app was found to be better than SaralDent software in many aspects.

Currently, 25% of all general dentists use a computer at chairside. This level of adoption is the result of a recent trend; approximately 80% of our respondents began to use a computer at chairside. Smartphones and their associated apps have revolutionized the way we access information.

Smartphones are more compact and do not have the capability of providing the amount of power and cooling that more powerful processors require. They are limited to lower voltage processors, although processors of this type are becoming more advanced and powerful. There are certain issues that needs to be discussed regarding the use of the programs SaralDent and ADC Ortho app.

Image Capture/Importing images.

Image capturing is better on computers as the quality of the images can be kept high. Computer hard drives are already over one terabyte (TB) and continuing to increase in size. Even the most basic computer comes with a 250 gigabyte (GB) hard drive today. Smartphones come with built-in camera and storage, ranging from 8 GB to 64 GB which can be an issue. In some cases, an expansion slot may be available for adding an additional memory chip for more storage capacity.

The Mean \pm SD values for SaralDent and ADC Orthowere $3.5 \pm 0.51(3.5)$ and $3.8 \pm 1.3(4.0)$ respectively. It was statistically highly Significant with $U=100$ $P<0.001$ and which shows ADC Ortho is better.

User Interface

The ADC Ortho app has a user interface much simplified through use of bright screen, large numbers on keypad and simpler input buttons and pages. Therefore, the orthodontists who were using the app could feed and manage the patient data whenever they wanted in their leisure time, at home or at dental office with ease unlike SaralDent which required them to be in front of the computer to feed the data with a relatively complicated user interface.

The Mean \pm SD values for SaralDent and ADC Orthowere $2.8 \pm 0.88 (2.5)$ and $3.6 \pm 0.49(4.0)$ respectively. It was Statistically Highly Significant with $U=625.0$ $P<0.0001$ and shows ADC Ortho is better.

Compatibility

Computers come with a more fully featured operating system due to having the computing power and memory requirements. Even the Windows operating system found on select smartphones is a slimmed down version of that found on a computer.¹⁹

The SaralDent app is easily compatible with the any of the windows operating system versions i.e., Windows 95/98/Me/NT/2000/XP/Vista, win seven, win 8 and works without any errors, whereas the ADC Ortho app is an Android based app and works only on Android 4.1 or higher versions.

The Mean \pm SD values for SaralDent and ADC Ortho were 3.5 ± 0.51 (3.5) and 3.0 ± 0.78 (3.0) respectively. It was Statistically Significant with $U=812.60$ $P<0.05$ and shows SaralDent is better.

Appointment Scheduling

Appointment Scheduling must be well managed by Orthodontists. SaralDent offers excellent appointment scheduling feature. Consequently, Orthodontists not only need to be mobile themselves but also need to be able to communicate with patients in different locations to make the appointments to best suit the schedule.⁹

The Mean \pm SD values for SaralDent and ADC Orthowere 3.4 ± 0.81 (3.0) and 3.9 ± 0.54 (4.0) respectively. It was Statistically Significant with $U=775.0$ $P<0.05$ and shows ADC Ortho is better.

Reminder Service

The reminder service feature is on both SaralDent and ADC Ortho app. SaralDent can be used to send emails or print the letter to be sent for reminding the patient. The app is handy to send a text (SMS) reminder with a few taps on the screen of the Smartphone.

The Mean \pm SD values for SaralDent and ADC Orthowere 3.4 ± 0.49 (3.0) and 4.4 ± 0.67 (4.5) respectively. It was Statistically Highly Significant with $U=375.0$ $P<0.0001$ and shows ADC Ortho is better.

Billing/Reports

SaralDent has option to keep record of all bills, prescriptions, lab assignments, receipts, referrals, purchases etc. and print or send through email. The ADC Ortho app has record of prescriptions, payments. SaralDent has more features in billing and reports, than ADC Ortho.

The Mean \pm SD values for SaralDent and ADC Ortho were 3.7 ± 0.79 (3.5) and 3.6 ± 0.67 (4.0) respectively. It was Statistically Not Significant with $U=1237.0$ $P=0.9333$.

Backup

Majority of the Orthodontists are in paperless environments where they are now storing x-rays as well as patient records, appointments, and billing information in digital format. Data backup is of utmost importance. ADC Ortho app has the option to take data backup and create a backup file using which the patient data can be imported/exported to another Smartphone and can only be accessed on the Smartphone.

The Mean \pm SD values for SaralDent and ADC Ortho 4.0 ± 0.78 (4.0) and 3.6 ± 0.49 (4.0) respectively. It was Statistically Significant $U=900.0$ $P<0.05$ and shows SaralDent is better.

Overall Experience

In this study, SaralDent software and ADC Ortho app was distributed to 50 Orthodontists and were asked for their overall experience for both the programs. The Mean \pm SD values for SaralDent and ADC Ortho were 3.6 ± 0.49 (4.0) and 3.7 ± 0.65 (4.0) respectively, with 'U' value 1175.0 and 'P' value 0.6022 which shows it is not significant.

SUMMARY AND CONCLUSION

Fifty orthodontists were selected from the Telangana population and were distributed with “SaraIDent 4.5” practice management software for the computer and “ADC Ortho” a custom-built application for Smartphone to use for a period of 1 year.

A comprehensive questionnaire with sixteen questions was designed to collect information from experienced orthodontists on orthodontic practice management software and app, of which ten questions were scaled and related to the importance and satisfaction with features according to positions to which descriptive statistical analysis and data was applied.

The Orthodontists were asked to Rate the Questions related to the programs SaraIDent software and ADC Ortho app on the scale of 1 to 5, where 1 = poor, 2 = fair, 3= good, 4 = very good, 5 = excellent.

In this study, Mean and standard deviation of all the ratings by orthodontists for SaraIDent and ADC Ortho were compared. Out of the ten questions asked ADC Ortho app was found to be better than SaraIDent software in five aspects. SaraIDent was better than ADC Ortho in 3 aspects. We have used Mann Whitney U test, and test values for Overall Experience on using SaraIDent and ADC Ortho were $3.6 \pm 0.49(4.0)$ and $3.7 \pm 0.65(4.0)$ respectively, with ‘U’ value 1175.0 and ‘P’ value 0.6022 which shows it is not significant.

This study illustrates many of the technical qualities of Smartphones and are highlighted by their direct comparison with those of Computer in Orthodontic practice management as the platform for the app and software are different. Applications are on the rise, with many clinicians and allied health workers already adopting smartphones successfully in a diverse range of practices Smartphones are well accepted and as their features and uses expand, they are expected to be the choice in the future for many Orthodontists. However, the extent to which Smartphones provide benefits due to their mobility has been significantly under investigated. There are many items still under consideration when considering using a Smartphone. The future work is to provide guidelines for developing and using Smartphone-based healthcare applications with focus on medico-legal and ethical issues regarding use of Smartphone-based orthodontics apps.

Rigorous evaluation, validation, and the development of best-practice standards for Orthodontic apps are needed to ensure a fundamental level of quality and safety when these tools are used.

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