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Preliminary Study on Online Orthodontic Screening Apps

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Abstract

Objective: During the pandemic COVID-19, a paradigm shift in dental education must be made. Physical teaching and clinical practical must be done in online manner to avoid close contact. An online orthodontics screening application is needed to cater during this misfortunate event. Thus, the objective of this study is to develop an online orthodontic screening for dental education and to assess the effective of the apps.

Methods: The development of online application was done using non-coding software provided by independent website. The online orthodontic screening consists of patient detail, extraoral examination, intraoral examination, summary and treatment plan. All dental specialists in USIM orthodontics clinic (orthodontist) were invited to answer several questions regarding the apps and undergoes the trial run.

Results: All subjects were in agreement regarding the details of patient, extraoral examination and intraoral examination except for the third molar condition and teeth rotation. The decision on the IOTN and the problem list also have some contention, however the variation is accepted as a preference by the specialist.

Conclusion: This study has demonstrated the ability of online dental education as a teaching tools and method in the COVID-19 pandemic era. It can be used as an additional aid and alternative to normal psychical classroom.

Keywords: dental, education, online, COVID-19, orthodontics

Introduction

The pandemic of coronavirus disease 2019 (COVID-19) have great impact on the dental education around the world. Conservatively, dental education was taught in classroom for theoretical part and clinical setting for the practical assessment. These two components are crucial to develop dental student into becoming a knowledgeable and skilful dentist. Soft skill such as empathy, effective communication, problem solving, and teamwork were also empowered in this two setting. However, the pandemic has force dental education to be taught online to minimal physical contact. This is because a strict and effective infection control are needed to prevent the risk of cross infection in dental practices and hospitals [1]. Government around the world have implemented restricted physical contact and movement among its citizen to curb the spread of

coronavirus. Face mask and hand sanitizer have been made compulsory within public area. The pandemic has introduced a new norm and challengers on method to deliver dental education. This new layer of challenges has taken many by surprise among academicians and students.

Online education is not a new concept. It has been introducing since many years ago. Tele-education, online learning, e-learning, virtual classes, distance learning and many more paraphrase have been used to describe online education. A systematic review suggested that open online courses on health and medicine can be used to provide continues medical education and could increase health literacy among common people [2]. Online education is also equivalent if not superior to traditional learning as stated in one study [3]. However, there are many problems faces by the receiver (student) and provider (academician). Some of the problem face by the student in developed country are internet connection, electronic device to access online education and unsuitable places to received education. Some area did not have a reliable and fast connection especially in rural area. This could make online education only available to certain population only. The cost for internet subscription is also expensive for the lower income group and beyond affordable. Moreover, electronic device to access online education is expensive. Some student uses tablet and handphone to access online content. However, in some cases, these electronic devices need to be share between their siblings. Lastly, during COVID-19 pandemic, online education is done at home where many people live in a confine space. The disturbances from noise and other family member could reduce the quality of education process.

Academician who provides online education need to be update in latest online software and need to be skilful to be able to attract the student's attention. An hour lecture online without interaction and communication will be monotonous. Exciting way of delivery with graphics, video and animation is needed to capture the attention of the new generation learner. This, however, require more time and skill to develop the online content. Compared to convention classroom teaching, an online class seems more challenging and time-consuming. Education institute also need to bear the cost of subscription of online application to be able to deliver the online classes. Online education can be based on module, series lectures, problem base learning, tutorial and quiz. The common method prefer by many countries is blended learning and computer-assisted learning [4]. Other approaches are multimedia simulation, web-based learning and e-tutorial as noted in the same study. Countless applications can be used for this purpose such as Microsoft teams, Zooms and Google classroom. A systematic review suggests that distance learning have no significant different to traditional method of teaching [5]. The different is only at the delivery process and method of teaching.

Thus, the objective of this study is to develop an online application that could be used for orthodontic online screening. This application can be used for education purpose and orthodontic record. Furthermore, it can be used for diagnosis of malocclusion and to develop treatment option.

Methodology

Conservatively, the development of online application required deep knowledge on coding. Coding is a type of language for computer to understand the given instruction. It is a binary code that uses 0 and 1 as instruction. Fortunately, nowadays there are many

websites and software that offer development of online application without complicated coding. For this project, the development of online orthodontic screening use bubble.io software to develop the application.

The application begins with users log in email and registration with password confirmation. Users will then be directed to the home page interface which includes several details on orthodontic screening. The home page contains patient history, extraoral examination, intraoral examination, investigation, summary & diagnosis and photos upload. In addition, the home page interface also contains patient and screening detail in the patient list. Patient histories contain detail such as name, registration number, age, gender and race. Medical history, family history, dental history, habits and main complaint were also included in this segment. In extra-oral examination, assessment of the skeletal pattern (sagittal, profile, vertical and transverse), soft tissue (lip competency, nasiolabial angle and togue) and temporal mandibular junction (palpation) were included. The intra-oral examination segment include assessment in dentition (oral hygiene, teeth present, teeth missing, teeth with poor prognosis, teeth with caries, teeth with abnormal shape and supernumerary), lower and upper archers assessment (shape, anterior crowding/spacing, incisor angulation, canine angulation, posterior crowding/spacing, third molar condition and teeth rotation) and teeth in occlusion (incisor relationship, canine relationships, molar relationships , overjet, overbite, crossbite and midline).

Investigation segments include lateral cephalometric, dental panoramic and other type of radiograph. While summary segment includes IOTN (Aesthetic and Dental health component) and diagnosis (problem list, treatment aims and treatment plan). Lastly, the photos upload includes extra-oral pictures (patient front, profile and ¾ turn photos) and intra-oral pictures (upper arch, lower arch, front occlusion, left occlusion and right occlusion). This application was then pre-test on five orthodontists to determine the usage on the orthodontic screening assessment. Based on the orthodontist feedback and recommendation, revision and correction were then made to the online application.

Result

All the orthodontists have no contention on the patient detail, patient history and teeth in occlusion. The extra-oral examination was all in agreement except for assessment on tongue and palpation on temporal-mandibular junction. Mixed result was noted in assessment of lower arch, upper arch, summary and diagnosis. The most difficult assessment are third molar condition and teeth with rotation. The results were shown in Table 1 and Table 2.

	Correct	Wrong	Unsure
Patient Detail			
1. Name, Age, Gender & Race	1.0		
2. Summary	0.8	0.2	
History			

1. Medical, Family & Dental History	1.0		
2. Habits & Main Concern	1.0		
Extra-Oral Examination			
1. Sagittal & Profile	1.0		
2. Vertical & Transverse	1.0		
Soft Tissue			
1. Lip Competency & Nasiolabial	1.0		
2. Tongue	0.6		0.4
Temporal Mandibular Junction			
1. Palpation	0.6		0.4

Table 1: Patient detail and extra-oral examination

	Correct	Wrong	Unsure
Intra-oral examination			
1. Oral hygiene	0.8		0.2
2. Teeth present	0.8	0.2	
3. Teeth missing & poor prognosis	1.0		
4. Teeth with caries	0.8		0.2
5. Teeth abnormal shape & supernumerary	1.0		
Lower Arch			
1. Arch shape	0.6	0.2	0.2
2. Anterior crowding / spacing	0.8	0.2	
3. Incisor& canine angulation	0.8		0.2
4. Posterior crowding / spacing	0.4	0.4	
5. Third molar condition	0.2	0.2	0.6
6. Teeth with rotation	0.4	0.6	
Upper arch			
1. Arch shape	1.0		
2. Anterior crowding / spacing	0.8	0.2	
3. Incisor & canine angulation	1.0		
4. Posterior crowding / spacing	0.8	0.2	

5. Third molar condition	0.2	0.6	0.2
6. Teeth with rotation	0.4	0.6	
Teeth In Occlusion			
1. Incisor, canine & molar relationship	1.0		
2. Overjet, overbite & openbite	1.0		
3. Crossbite	0.8	0.2	
4. Midline	0.6		0.4
Summary			
1. IOTN (AC) & (DHC)	0.6	0.4	
Diagnosis			
1. Problem List	0.6	0.4	
2. Treatment Aims & Plan	0.8	0.2	

Table 2: Intra-oral and summary & diagnosis

Discussion

Global pandemic brought by COVID-19 have restricted all day-to-day psychical activities and close contact. Many countries struggler to find ways to tackle this pandemic and put it under control. Dental education that involves practical and theoretical classes should be reduce and new method of online teaching should be adopted. Online education such as Google classroom, Zoom, Microsoft team and mobile application can provide this. However, a survey done on orthodontics application for smartphone revealed that the information on most of the application is not independent and not validated [6]. Thus, there are needs to development online orthodontic application for education purpose which have been approved and validated.

There is mixed reaction on student perception of online classes. Some were embraced it with open arms, and some have negative view. Many students consider online education to be beneficial and additional aid to their learning experience rather than a replacement for the conventional classes [7]. Student could also choose learning programs base on merits and quality of the programs offered [8]. The delivery system for education does not have to be confined in psychical classroom anymore. An online education can be beneficial to student and lecturer. The student can take learning at their own pace while lecturer can save time and focus on the weak student. However, in country where the availability of internet connection is low, online classes were found to be ineffective as classroom classes [9]. There is various factor to be consider in online learning such as fast internet connection, availability of electronic device and decent knowledge of software.

Nowadays, there are many online applications dedicated for orthodontics. However, majority of the apps are patient focused and for games purposes [10]. Others focused on clinical practice and patient orientation. There is need to create online application mainly for education purpose. The development of the application should be validated with an updated data and based on evidence [11]. An online diagnosis of illness can be made possible in the health care sector with the advance of internet facilities. Apart from online application, dental education can be made possible by video. Many varieties of orthodontics

information available on Youtube. However, the information and content were generally inadequate and poorly made by orthodontics patient [12]. Another systemic review also found that the information on adult orthodontics website is low to moderate quality [13]. There is a need to develop online application screening for dental education by the academician themselves.

A successful orthodontic screening is based on the accurate diagnosis of malocclusion. A successful diagnosis of orthodontic screening depends on good quality of picture taken. As high as 80% of clinician used photographs and clinical notes to plan orthodontic treatment [14]. According to the same study, accurate judgment of molar and canine relationship varies between 79.9% to 51.3%. A deviation of camera angulation could decrease accuracy significantly [14]. Our study also concurs the same result whereby there are some variation answers to incisor, canine and molar angulation. This show that the important to have a standardized method of taken photographs and the way to interpret it. Another way to increase the accurate diagnosis in online apps is to have digital study model. Traditionally, study model was taken using alginate and cast into plaster stone. However, in line with advance of technology, study model can be made using intraoral scanner. Although there are some different between plaster and digital study model, the recorded changes were considered clinical insignificant [15]. The same study also noted that vast majority of situation, a digitalized study model can be successfully used as an orthodontic record for diagnosis purpose [15].

Conclusion

The global pandemic of COVID-19 has force sudden change on all aspect of life including dental education. The development of online orthodontic screening offers a new norm of teaching for dental student. It can be used as sole teaching method or as an additional tool to the normal psychical classroom. However, more impassive should be made to enhance the quality of picture to be able to have more profound diagnosis.

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