IIIDentEx2019
International Invention & Innovation in Dentistry Exhibition 2019

25th June 2019
Hatten Hotel Melaka, Malaysia

"Sustainable oral health through innovative solutions"

#infinitepossibilities
Welcome to the 1st International Invention and Innovation in Dentistry Exhibition 2019 (IIIIDentEx2019), proudly organized by The Faculty of Dentistry, Universiti Teknologi MARA, Malaysia. I am very grateful and honoured to have served as the patron of the organizing committee. On behalf of the organizing committee, we would like to express our gratification at hosting this conference which has a programme that condenses, unequivocally, the dynamic, challenges and relevant contribution of invention and innovation in healthcare, especially in oral health sector. On the path to generating new ideas and a sustainable future, this exhibition will connect leaders and institutions, accelerate actions and act as a gateway to solutions.

Our programme is taking place in a city of Melaka where it offers a world-famous historical site which blends in cultures and heritage architecture. Furthermore, our venue for this event is very close to some tourist attractions including the renowned, A Famosa. There are lot of ideas to be explored in this event and stimulating great minds for years to come. Our programme call was answered with more than 70 abstracts authored by one or more persons. The review panel was integrated by various discipline or content-based experts in wide areas beyond healthcare, and comes from all over the world.

I hope that Melaka will not only serve as a picturesque backdrop for stimulating intellectual discussions and sharing ideas, but also offers you with places for rewarding socialising with colleagues and friends. I am sure the inventions and innovations presented here will enrich and further strengthen the commitment to improve the quality of life of the community.

I would like to congratulate the organising committee lead by Dr Nik Mohd Mazuan who had worked tirelessly ensuring the programme a success. My thanks also to all the sponsors who make organising the event with great difficulty.

I wish you a memorable conference experience, full of new learnings, exchange, and inspiring moments

Regards

PROFESSOR DATO’ DR MOHAMED IBRAHIM ABU HASSAN, FASc
FOUNDING DEAN OF FACULTY OF DENTISTRY
UNIVERSITI TEKNOLOGI MARA (UiTM)
Dear Participants, Visitors and Entourage,

It is my great pleasure to invite you to take part in this inaugural event, 1st International Invention and Innovation in Dentistry Exhibition 2019 in Melaka, Malaysia. This event as well the chosen place, Melaka has a lot of things to offer, both intellectual and historical themes.

It has been an enormous challenge for all committees as we have to design and build such a new event in this particular field, where science, knowledge, expertise, experiences, leadership and communication and off course creativity are combined. This event is designed to provide an arena for creative ideas to be presented in such manner where people share and present their ideas to the public and healthcare colleagues alike.

In accordance with the exhibition theme, “Sustainable Oral Health Through Innovative Solutions“, we have developed a programme which offering a significant and valuable contribution to healthcare focusing on best research and innovations in practice but still being deeply rooted into oral health and its related areas.

I do hope you will accept our invitation to join the exhibition or competition, share your experiences and contribute to the discussion. Then enjoy staying and creating friendship in the magnificent surrounding of historical city of Melaka, Malaysia.

With best regards

DR NIK MOHD MAZUAN MOHD ROSDY
PRESIDENT OF INTERNATIONAL INVENTION & INNOVATION IN DENTISTRY EXHIBITION (IIIDENTEX) 2019
PROGRAMME

REGISTRATION & BOOTH SETUP
8:00 am
Foyer, Level 11
Get your registration packs & collect your receipt
Booth setup in Grand Ballroom (8-9am)

JURIES & PARTICIPANTS BRIEFING SESSION
8:30 am
Meeting Room, Level 11
Juries briefing session

PROJECT PRESENTATION I & EXHIBITION
9:00 am
Grand Ballroom, Level 11
Participants briefing session

TEA BREAK
10:30 am
Foyer, Level 11

PROJECT PRESENTATION II & EXHIBITION
10:45 am
Grand Ballroom, Level 11
First session of presentation
STEM Exhibition & Activities

LUNCH BREAK
12:45 pm
Chatterz Cafe, Level 11

PROJECT PRESENTATION III & EXHIBITION
2:00 pm
Grand Ballroom, Level 11
Second session of presentation
STEM Exhibition & Activities

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PRIZE GIVING & CLOSING CEREMONY
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CATEGORY A
ABSTRACT

CentaGel-SP: Socket Preservation after Tooth Extraction

Luay Younis¹, Mohamed Al-Naser¹, Tommy Julianto Bustami Effendi², Tara Bai Taiyeb Ali³, Mohamed Ibrahim Abu Hassan¹

¹Faculty of Dentistry, Universiti Teknologi MARA, ²Faculty of Pharmacy, Universiti Teknologi MARA, ³Faculty of Dentistry, MAHSA University
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Background: After tooth extraction, the alveolar ridge will decrease in volume and change morphologically. If bone resorption is significant enough, then placement of prosthesis may become extremely challenging. Post-extraction maintenance of the tooth socket minimizes alveolar ridge resorption and, thus, allows placement of a proper prosthesis that satisfies esthetic and functional criteria. Objectives: This study is designed to investigate the effect of 3D titrated extract of Centella asiatica (TECA) hydrogel (CentaGel-SP) on the inflammatory induced senescence marker, senescence-associated heterochromatic foci (SAHF) and cell DNA proliferation. The study also assessed the influence of the gel on migration of human periodontal ligament fibroblasts (HPDLFs) in wound healing. Materials and Methods: Inflammation was induced by TNF-α in in-vitro cell samples which were treated with the optimal concentration of 20μg/ml TECA hydrogel. The hydrogel effect on senescence marker, SA-β-gal, activity was investigated by histochemical staining. SAHF were investigated by using a fluorescent DAPI stain. Analysis of DNA replication was done by treating the cell samples with EdU fluorescent stain. For assessing fibroblasts migration, scratch wound healing assay and Pro-Plus Imaging software were used. Results: SA-β-gal was suppressed (30% positive cells) in the TECA treated cultures as compared to the non-treated cells (81.33% positive cells) (p<0.05). The results demonstrated a high percentage of cells exhibiting SAHF in the non-TECA treated samples (78.4%) as compared to the TECA treated samples (26.3%) (p<0.001). TECA treated samples had higher percentages of proliferating cells (p<0.001) as compared to the controls. Scratch wound test indicated that the cell migration rate was higher (16.77 µm²/hr) in the treated as compared to the controls (9.53 µm²/hr). Conclusion: Premature irreversible cell cycle arrest can be induced in HPDLFs upon inflammation. The new formulation of 3D TECA hydrogel suppressed the inflammatory mediated cellular senescence and decreased cell DNA damage. Enhancing fibroblasts migration may accelerate tissues regeneration capacity during wound closure. Hence, CentaGel-SP may play a role in the preservation of socket after tooth extraction. Clinical trial is ongoing.

Keywords: CentaGel, fibroblast migration, SA-β-gal, SAHF, TECA.
An Innovative Dental Model for Preclinical Non-Surgical and Surgical Exercise in Periodontology for Under and Postgraduate Students in the Faculty of Dentistry, UiTM

Fouad AL Bayaty, Mohd Faizal Hidayat, Mahyunah Masud, Farha Ariffin, Mazli Bonit
Faculty of Dentistry, UiTM Campus Sg Buloh
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The aim of the periodontology program at the Faculty of Dentistry, UiTM is to provide students with advanced knowledge and clinical skills so they can become competent clinicians upon graduation. The preclinical module was designed to train the students to perform all the periodontal procedures on the upper and lower jaw model before moving to the clinical year. The cost for an imported upper and lower jaw models is RM 1600. Currently, there is a lack of dental models made locally for training dental students. The objective of this project was to fabricate a dental teaching model for preclinical non-surgical and surgical exercise in periodontology to trainee students in acquiring these skills. Clear epoxy purchased from the local market was used to prepare the model teeth and base. Pink silicone base was used to prepare the gum around the teeth to simulate the normal and diseased human gum. The dental model was given to 11 postgraduate students, to performed non-surgical and surgical procedures. A questionnaire was distributed to evaluate their feedback. Results showed positive feedback, which justifies the fabrication of these teaching models. This innovative model is locally made, cheaper and reusable, which is inadvertently more economical and practical. The costing of our teaching model is RM 47 which is about 35 times cheaper than the imported ones (RM1600). This model could be considered as an alternative cost-effective tool in providing student to master preclinical non-surgical and surgical exercise in periodontology.

Keywords: dental model, preclinical exercise, periodontology, students
ABSTRACT

Set It Right(SIR)-Teeth Set Up Made Easy

Nor Faharina Abdul Hamid, Nur Hafizah Kamar Affendi, Tengku Fazrina Tengku Mohd Ariff, Lim Tong Wah, Norfazillah Zaini
Universiti Teknologi MARA
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Background: Arranging anterior teeth with correct teeth position and inclination has been a challenging task for beginners as it involves technical handling and demands more laboratory skills. This project presents the development of a new approach for teaching maxillary and mandibular anterior teeth set-up in the complete denture. The "teeth set-up template" is designed to assist and guide the undergraduate dental students to the ideal anterior teeth arrangement for their pre-clinical complete denture project. Problem statement: Pre-clinical students realized settings up complete denture teeth are demanding for them as they are newly exposed to the procedure. Furthermore, accurate intercuspatian and precise occlusion are also one of the factors to contemplate during teeth arrangement. Objective: To provide a simple yet effective teeth set-up template for the dental undergraduate to assist them in maxillary and mandibular anterior teeth arrangement for their preclinical project. Novelty: This template is designed to aid novice dental undergraduates by visualizing the teeth arrangement symmetrically especially from the frontal view. By providing a 3-dimensional template, students are able to comprehend and envisage the maxillary and mandibular anterior teeth layout compared to looking at images in books and videos. It also guides them to the standard anterior teeth positioning and inclination. The benefit to the user: Fixed ideal teeth positions and alignments on the template will facilitate the teeth arrangement on the occlusal rim. Utilizing the template will accelerate dental students' progress, as it helps to reduce errors during teeth set-up. Furthermore, it prevents demotivation and encourages students' learning.

Keywords: artificial teeth, clinical technique, complete denture, teeth arrangement
Recall appointment for of paediatric dental patients may seem like a trivial issue but failure to have regular check-ups can result in delay in treatment and prolonged treatment time or worsened prognosis. The duration of interval for recall is case dependent and may vary according to many factors. This brings about the need to customize recalls and also highlights the importance of incorporating anticipatory guidance for the visits. Pre-visit imagery is also proven to increase patient compliance and reduce anxiety. A recent audit done at Faculty of Dentistry, UiTM showed that paediatric patient attendance for recall was poor and did not achieve the target set by American Academy of Paediatric Dentistry (AAPD) guidelines. This project aims to improve the recall attendance by introducing changes to the existing Integrated Dental Electronic Record Management System (IDERMS) and creating a repository of videos and patient education material. This system will be the first of its kind which allows the operator to send customized information and educational material using existing patient information system and social media platforms. This product will also have commercial value as the system and repository of educational tools can be used by dentists across the board.

**Keywords:** anticipatory guidance, recall, paediatric dentistry
Activity Based Assessment of Undergraduate Dental Students’ Soft Skills

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Introduction: Soft skills are associated with a cluster of personality traits that characterise one's relationships with other people. These skills can include social graces, communication abilities, language skills, personal habits, cognitive or emotional empathy, and leadership traits. Year one students at Lincoln University College have to undertake professional development and information technology (pdit) course aimed at preparing them as wholesome professionals. The module’s objective is to enhance dental students’ learning, resourcing information, presentation and communication skills, emotional intelligence, leadership and group dynamics. This presentation describes how viral video and creative project innovation are used to assess student’s soft skills.

Methods: The two projects formed the main assessment of the pdit module and carried out in semester two. Viral video development and project innovation activity are a 3-week and 6-weeks assignment, respectively. A briefing session introducing the theme, aim, objectives and conduct of the assignment are given at the beginning of each assignment. Students are then randomly grouped (4-6 students per group) and worked independently to produce the video or complete the project, to be submitted at the end of time given. Video assessment is via class presentation by invited lecturers based on an agreed criteria: video content, impact and video coherence, creativity (cinematography), visual aesthetics and video editing and oral presentation skills. The activity based assignment assessment was three-fold based on an agreed criteria namely, layman’s popular votes, peer assessment and, expert opinion. An independent external judge is invited to provide an unbiased assessment. Results: in all, 37 viral videos and 35 creative project innovations were developed by four batches (intake 2014-2017) of year one students. Several have won the viral video awards in the national competition. Conclusion: Student evaluation of these activities showed students were able to practice good group dynamics, manage their time well, able to critically appraise information they collected, translating information into physical outcome, were also more confident of facing the audience and even had fun in producing the assignments.

Keywords: soft skills development and assessment, viral video, project innovation, dental undergraduates
Improving Education of Tooth Brushing Training among Schoolchildren

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Background: Oral health education is effective in establishing good oral health habits among school children. Proper brushing technique besides the type of toothbrush, is effective in plaque removal. By mean of advanced technology, the teaching of proper brushing technique could be created to enhance teaching and learning activities among school children effectively in a fun way. Five Dental “Dedicated Promotion Team (DPT)” in Zon Titiwangsa and fifty children from Sekolah Kebangsaaan Hisamuddin Alam Shah had been interviewed regarding the teaching of tooth brushing in schools in a conventional method. We found that the Dental “DPT” had difficulty in getting full cooperation from schoolchildren (40%) as the schoolchildren did not pay attention during the teaching (60%). They also faced the time constraint due to the high number of schoolchildren per session. From the schoolchildren perspective, most of them (80%) did not focus due to the difficulty accepting instruction as tooth brushing education was given in a large group. Both DPT (60%) and schoolchildren (100%) agreed that the location of tooth brushing education is not proper as it was performed near the drain, the field and at the assembly site (away from the water source). Objective: This study aimed to explore the opportunities for improvement in delivering the tooth brushing technique by “DPT”, Federal Territory of Kuala Lumpur & Putrajaya (FTKL & P). novelty: Hence, The Oral Health Division of FTKL & P has developed the idea of using robotic kit for tooth brushing education. Benefits to User: During the pilot study, all the schoolchildren (100%) found that the robot was able to demonstrate the tooth brushing techniques clearly and they could easily remember the steps. Compared to the previous method, the session can be done at a more appropriate location (e.g. classroom or science laboratory) and the knowledge of tooth brushing technique was increasing 24%. In addition, the reduction in operating costs by Ministry of Health in a school is 52.8%. Conclusions: Robotic tooth brushing kit is able to attract the attention of the schoolchildren to learn effective technique and indirectly enhance the image of the Ministry of Health Malaysia.

Keywords: tooth brushing, dedicated promotion team, robotic
LAVA : Burn Without Flame
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A dentist’s job is to create smile on patients’ face. Denture fabrication is one the most commonly done dental procedures in primary clinical settings. It is the replacement of missing teeth with artificial set of teeth. To produce a successful denture, the patient’s maxillomandibular jaw relation (MMR), which also known as ‘bite record’ has to be recorded accurately. Dentists often heat a hot plate/scrapper over flame for MMR recording. Whilst this is an effective technique to record MMR, there are some problems that we might encounter while dealing with flame, namely the risk of fire accidents. Sometimes, we have to wait for our dental assistant to replenish the Bunsen burner if gas runs out in between procedures. The hot plate will also need to be reheated and overall this will lengthen the duration of the procedure. Another important drawback is the wastage of excess wax that will increase the material cost. Our project aims to reduce cost, avoid the risk of fire or burn, and implement the Jabatan Keselamatan dan Kesihatan Pekerjaan (JKKP) standard. Most importantly, our goal is to achieve ‘burn without flame’. We implement the concept of portable electric immersion heater to invent the hot plate by replacing the spiral tube water heating element with a flat fan-shaped plate. There will be a holder used to hold the heated hot plate while adjustment or trial of wax rims is ongoing and also a reservoir to accumulate the melted wax to be reused. High availability and easy accessibility to materials in the market means our project will be feasible to be carried out. Ultimately, we hope our innovation will contribute to time saving, wax saving and zero fire risk.

Keywords: bunsen burner, denture, electrically-generated hot plate, maxillomandibular jaw relation, wax rims
Virgin Coconut Oil (VCO) is well known of its wide benefits to oral and general health. The ayurvedic technique of ‘oil pulling’ has been practice by mostly in India and recently has spread to the worldwide. The Activated Virgin Coconut Oil (AVCO) is a modified version of VCO where the effect of free fatty acids inside VCO is fully released thus provides more effective effects to address oral problems. The objective of this invention is to provide a halal, green and non-alcohol mouthwash as an alternative to the conventional one in market. The IP (patent) has been granted and the id number is PT6646/UIAM/18. This invention will benefit the public especially those who looking for the alternative in using mouthwash as this mouthwash offers halal, green and non-alcohol based mouthwash.

**Keywords:** mouthwash, virgin coconut oil, VCO
Background: The incidence of oral cancer has risen in the past decade and is usually recognized when symptomatic and at a late stage. The overall 5-year survival rates for oral cancer have remained low at approximately 50%. However, this can be reduced by early detection. Problem statement: 1. Lack of training of health professionals for early detection and diagnosis. 2. Patient reluctance to consult a health-care professional due to lack of awareness and access to health care, especially in patients with low socioeconomic status. 3. Our limited ability to differentiate oral precancerous lesions at high risk of progressing into invasive carcinomas from those at low risk. 4. The gold standard for oral cancer diagnosis remains tissue biopsy with histological assessment, but this technique needs a trained health-care provider, and is considered invasive, painful, expensive and time consuming. Objective: Saliva can be easily obtained in medical and non-medical settings, and contains numerous biomolecules (biomarkers), including those typically found in serum for disease detection and monitoring. Mass Spectrometry (MS) allows us to examine a salivary proteome in minute details. Mass spectrometry platforms are already capable of reporting tens of thousands of events in less than a few minutes from a microliter of blood through protein identification. Rapid, low-cost mass spectrometry with much higher clinical sensitivity and specificity for the detection and monitoring of disease through salivary biomarkers may eventually dominate clinical diagnostics. Novelty: ‘A real time detection of cancer through salivary biomarkers using a 3D pen like probe and mass spectrometry’. Benefit to Society: Saliva can be obtained by patients themselves or by personnel with little medical training. Furthermore, saliva collection is associated with less stress and discomfort to the patient/donor. Therefore, saliva-based diagnostics can be applied in medically disadvantaged areas or non-conventional medical settings, such as in developing or under-developed countries, remote rural areas, patients’ homes, as well as in the dentist’s office or neighborhood pharmacy.

Keywords: oral cancer, salivary biomarkers, mass spectrometry
Dental i-Learning

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PKPD Kuantan's Promotional Unit is a unit that conducts activities in promoting dental health such as holding dental carnivals, exhibitions, lectures, dental camps as well as tooth brushing trainings. However, there are still problems and weaknesses in the unit's effort to spread dental information due to the lack of good teaching aids and modern information delivery techniques. Before this, dental lectures only used flipcharts or presentation slides which are dull. Now, PKPD Kuantan's Promotional Unit has created an interactive dental website called Dental i-Learning to make dental lectures more interesting. Dental i-Learning is an innovative project inspired by PKPD Kuantan's Promotional Unit in 2016. This project/website was created using an online application called Wix.com. This project is created with the objective to make the teaching and learning of dental health information towards the target groups in a creative and innovative manner. In line with the globalisation era, delivery of dental health information should be interesting enough to attract the attention of all target groups. This website does not only provide dental health information, but it also gives user access to game templates, tooth brushing charts and lesson plans for dental personnel and teachers to use in delivering dental health information to the public. Users may also view videos and presentation slides of past dental talks created by PKPD Kuantan's Promotional Unit. Furthermore, the website has interactive online games for people to play such as crossword puzzles, dental quizzes and dental trivia. The website was launched to the public in 2018. Beginning 2018, all dental promotional activities at schools and health carnivals have started to use the website. Feedbacks given from various target groups were positive and inspiring. Dental i-Learning has made it easier for all dental personnel and teachers in their effort to spread dental information in a fun and interactive learning method.

Keywords: dental i-Learning, interactive dental website, Unit Promosi PKPD Kuantan
ABSTRACT

School Referral Tracker

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Oral Healthcare for school children in Malaysia is known to deliver comprehensive dental care to primary and secondary school students. The concept of this programme is through incremental approach with focus on prevention, early detection and control of oral diseases to achieve orally-fit status among school students. School dental team carries out annual regular dental examinations, preventions and treatments at appointed schools. Some examples of clinical prevention initiatives are fissure sealants and oral health promotions while restorations and scaling are part of the basic treatments. There are certain conditions, treatments and further investigations need to be perform only in dental clinics by appointment basis such as extraction of firm retained root, intraoral radiograph and oral pathology cases. Therefore, referral for such treatments to a nearby dental clinic is compulsory to complete all required dental treatments in order to accomplish orally-fit status. School referral tracker is a system that helps to organize, manage and track the flow of students being referred by school dental team to nearby dental clinic for management of required needs. This innovation is created as previous system for referral has always been neglected due to inconvenient process and inadequate communication among parents and the dental team thus it affects Key Performance Indicator (KPI) of orally-fit status among school children. The objectives of this project are to trace referred students to dental clinic, to complete all cases needed within particular period of time and to achieve KPI. Students will be call for screening and indicated students for referral will be given letter. Their details will be recorded in the system. Appointed staff will make a phone call to notify the parents. During the visit, staff will recognize the students and update the system. There were a few systems that was built earlier but this is the only system that involves appointment slots specifically allotted for students referred from schools. This is a friendly system for non-smartphone users, accessible by dental staff and gives direct notification to parents by letter and phone call. It also creating awareness among parents on the importance of achieving orally-fit status.

Keywords: appointment, orally-fit, school children, school referral, tracker
ABSTRACT

Automatic Stainless Steel Bur Disinfection Container

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In the dental practice, bur and hand piece are very important dental instruments. They are used for filling of patients' carious tooth. Disinfection is mandatory for every dental instruments including burs and hand pieces. The bur used will be disinfected by immersed in antisepic solution. Most disinfectant functions have bactericidal, fungicidal, virucidal and tuberculocidal properties. We used sterile instruments and burs each patient. Thus, a bur will be disinfected few times in a day. Bur soaked for too long in disinfectant solution will cause blunt, corrode and rust. Conventionally, the use of digital external timer, tweezer, container, and gauze are required for bur sterilization process for every patient. This process is inconvenience as it interferes with the dental assistant task. There is risk of spillage, cross infection and oversoaked. Until now there has no accurate benchmarking to show that the bur soaked in the solution at the predetermined time, yet did not achieve the optimum effect of the solution. This project is a stainless steel mechanical device that fit to all solution. It applies the concept of tea strainer, bread toaster and air fryer. Our objectives are to minimize the risk of spillage of disinfectant, cross infection on tweezer and oversoaked bur and also optimize the function of the disinfectant. Used bur will be placed in the strainer and carriage handle will be press down vertically to connect with plunger until the bur is fully soaked. Timer will be set according to manufactured suggestion disinfection time. Strainer will be automatically detached from the plunger when the time set is completed. Sterilized bur is now ready to be transferred to a bur stand and ready to be use. This device is autoclavable, mechanically function, easy handling, accurate, fit for all type of disinfectants, save time, and can work independently. This device can maximize the use of disinfectant in turn of optimizing sterilization of the bur which lead to efficient and high quality dental procedures.

Keywords: autoclavable, accurate, bur, disinfection, mechanical device
Orthodontic Indices Digital Analysis System

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Orthodontic indices digital analysis system is a system that apply Graphical User Interface (GUI) system by National Instrument (NI) to aid in measuring, recording and analysing orthodontic indices. NI is known as global leader in automated test and automated measurement systems. Their approach is by building tools that simplify complexity. NI LabVIEW is a powerful engineering software used to perform data acquisition, measurement, test, and automated control applications. NI LabVIEW software has a specialized image processing function which is called LabVIEW Vision that being used to create this system. It combines 3 common orthodontic indices, which are Peer Assessment Rating (PAR) Index, Bolton Analysis and Index of Orthodontic Treatment Needs (IOTN). These indices are widely use in assessment, pre and post orthodontic treatment but still being measured manually by using tools like ruler, calliper, PAR ruler, score sheet and IOTN list. This process is tedious to some, hence, there is risk of inaccurate reading, human error and misanalysis. Furthermore, none of the orthodontic softwares in the market equipped with these 3 indices. Objective of this project is to digitalize orthodontic indices. This system will replace formerly used tools and act as one tool for all. An image of a dental cast captured by camera and transferred to computer via Universal Serial Bus (USB) cable. Indices will be analysed directly according to index option chosen by the operator. Point needed will be marked in the image, the system will directly measure and analyse. The result will appear rapidly and tabulated in excel form. This innovation has proven to improve record keeping of patient’s data and support green environment with less usage of paper and safer patient’s record keeping. This also will trigger other researchers to explore, innovate, test and validate other software and technology available in the market.

Keywords: bolton Analysis, digital measurement, LabVIEW software, orthodontic, PAR index
Secretome of Dental Stem Cells

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Extraction of healthy tooth for creating space in orthodontic treatment is common and the tooth become an unnecessary biological waste. Most people did not realize that this biological waste is the source for most accessible biological materials that has multi-function in tissue regeneration. For almost 20 years, mesenchymal stem cells from dental pulp and periodontal ligament of extracted premolars have been studied and showed promising result in tissue engineering specifically related to bone regeneration. Current regenerative research has started to shift on the secretome produced by the dental stem cells rather than the life cell itself in tissue regeneration. Secretome is the collection of proteins, growth factors and cytokines secreted by the stem cells. This project aims to produce the secretome of dental stem cells from the extracted premolars and produced proteomic profiles specifically from PDL stem cells for further tissue regeneration research. The periodontal ligament stem cells (PDLSCs) and dental pulp stem cells (DPSCs) will be isolated from the extracted premolars of patient for orthodontic treatment for secretome collection in laboratory setting. The collected secretomes will then be tested for soft tissue grafting of gingival recession and pulp therapy in vitro and in vivo. Thus, the biological waste of the premolar teeth will serve as the source for stem cells secretome which create a potential commercialization for bioregenerative materials.

Keywords: secretome, mesenchymal stem cells, periodontal ligament, regeneration, pulp
Do You Want To Burn.....?
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Tobacco is one of the main risk factors for a number of chronic diseases, including cancer, lung diseases and cardiovascular diseases. The World Health Organization (WHO) 2018 report stated that 7 million people died due to tobacco related diseases each year. The dental team can play a very effective role in helping smokers to quit smoking and creating a tobacco free community. This project aimed to create an interactive kit that can be used by the dental team and other health care professionals to assist smokers quit smoking. Most tobacco cessation help desk rely on brochures and gross pictures to show smokers the dangers of smoking. It is hoped that this innovative project will provide a fun and interactive way to engage and counsel smokers to give up the bad habit and to increase awareness among the public on the bad effects of smoking. It can also assist dentists to explain various information about smoking and tobacco such as the contents of a cigarette, the effects of smoking on health, finance and social as well as smoking cessation techniques.

Keywords: tobacco, counselling, interactive, smoking cessation
ABSTRACT

D-Kit on-the Go: A Multitool Dental Backpack System Suitable for Movable Dental Services

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Mobile dental clinic is a term used for providing dental services outside hospital or clinical settings. Services especially in the rural areas would benefit the society in large as transportation to dental services becomes a major problem. Damage and misplace of items may also occur and replacement of the dental equipment’s are costly. In addition, some dental gear would require heavy lifting to the planned mobile clinic site. This leads to a novel idea of having a multitool hardcase backpack that could carry all the instruments in one place and strong enough to resist knocks thus avoiding damage. The idea also plans to make the suitcase waterproof to avoid water contamination especially to dental materials. In addition, the bag may also transform itself to a counter board for usage during the dental service provided. This project hopes to allow provide better dental services to the community especially in rural areas without causing damage to existing dental equipment’s thus directly and indirectly saving money on repairs. It also prevents missing items as each bag will have its own inventory to be utilized. Cost of the apparatus is cheap however project has enormous potential commercial value as the bag is durable and strong. Other prospects advantages include any items requiring safe storage can also be placed in the bag itself besides just dental instruments and materials.

Keywords: mobile dental clinic, dental materials, operative dentistry
Teeth Alignment: A Practical and Cost-Effective Model for Preclinical Training

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Dental undergraduate studies require the use of extracted teeth for practical training during preclinical studies in the curriculum, however aligning them to fit a maxillary or mandibular arch poses a few challenges. Throughout dental school training, conventional moulds for teeth alignment set-up have been used but fits only standardized extracted size teeth. Unfortunately, teeth sizes vary and may cause misalignment of teeth set-up upon hardening of models casted using Plaster of Paris (POP). These models also tend to get mouldy overtime. Although utilizing artificial teeth on Frasaco models may be beneficial, use of natural teeth remains the best material for teaching purposes as it mimics the actual clinical scenario. This project aims to create a reusable acrylic based model that is able to incorporate a variety of natural and artificial teeth with minimal effort. This is a novel prototype designed to help dental students minimize laboratory procedures and errors. They will be able to maximise their time during the preclinical training session. Moreover, this prototype model is cost effective, reusable and environmental friendly in the long run and requires minimal usage of POP.

Keywords: dental education, simulation model, operative dentistry
Enhancing Undergraduate Students’ Sensitivity to Less Privileged Community via Oral Health Promotion Activity

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Introduction: Health disparities and health equity are global issues warranting more attention today. Health disparity refers to a particular health difference that is closely linked with social or economic disadvantage often negatively affecting less privileged groups of people (example: mental health or disability) from getting access to the care they needed. A compulsory society-based community project focusing on the above groups was developed for year-3-clinical students at Lincoln university college aiming to sensitize them to the dilemma of the less privileged Malaysian communities in seeking for health care. This presentation shares how this was done in an elderly and disabled homes.

Methods: This is a six-week compulsory assignment. One briefing session introducing the aim, objectives and conduct of the assignment was given at the beginning. Relevant lectures on planning, health promotion concept and program evaluation were given. Each clinical groups (10-15 students per group) then worked independently to plan for an oral health promotion project on the less-privileged groups of their choice. Program implementation required a minimum of two visits to the chosen facilities. Program evaluation was via on-site assessment, post-program presentation and reflection discussion, and short report. Results: Over the last five years, several facilities of elderly and disabled communities have been visited. Students’ initial attitudes towards the group were either one of anxiety, fear or uncertainty of facing the target groups. The activities included were general (bmi, blood pressure glucose tests) and oral health screening, oral health education or health instruction activities, recreation and counselling sessions.

Conclusion: Postmortem reflection discussion revealed that students found the experience was beneficial as part of their learning activities, enable them to better understand the dilemma of the target group in seeking care and given care. Students also agreed that prevention through advocacy efforts are important in handling these groups. Students found the project enhances their ability to practice good group dynamics, manage their time well, able to critically appraise information they collected, translating information into physical outcome, were also more confident of facing the audience and even had fun in intermixing with the target group.

Keywords: health disparities, health equity, less privileged communities, oral health promotion
ABSTRACT

SafeCap: Towards Zero Cases of NSI

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The Malaysia’s Department of Occupational Safety and Health stated in one of its goals is to reduce the rate of accidents to worker by 2020. Needlestick injury (NSI) is major occupational hazard among healthcare workers. Since needles and sharp instruments are commonly used during dental procedures, workers in the dental profession are prone to sharps-related injuries. Needlestick injury (NSI) is mainly caused by unsafe steps taken during uncapping and recapping of the needle. Needlestick injury (NSI) are major occupational hazard among healthcare workers as it can cause transmission of infectious disease such as Hepatitis B, Hepatitis C and HIV. Often in the general dental practice environment NSI has been one of the major concerns especially during anaesthesia procedure or any other procedures involving the usage of needles. Even though there is an invention that currently been used in a certain clinic, there are still reporting incidences of NSI. Thus, “SafeCap” is designed to introduce safer steps during handling of needles aiming towards lower incidence of NSI. “SafeCap” is an innovation that incorporate the tightness of a lock enhancing the safety of needle handling. The main benefit of “SafeCap” is to protect the fingers during handling of the needle for the safety of the healthcare workers and patients. It also prevents the syringe from falling out of the needle cap. The metal structure of “SafeCap” allows it to be autoclaved making it a hygienic and reusable product. Besides, “SafeCap” is lighter compared to the current invention that is being used in clinic especially in Johor districts. As needle injuries is preventable, all health workers have a duty of care towards themselves and the people surrounding. Using of the “SafeCap” can benefit the community by reducing the transmissible rate of blood borne pathogen. Moreover, it helps in increasing the efficiency of the healthcare workers during the procedure that involve usage of needle. Thus, “SafeCap” is an improvised invention to help reducing the prevalence of needle stick injuries.

Keywords: needlestick injury(NSI), SafeCap, healthcare workers
CompoWell: Reducing Composite Wastage in Clinical Practice

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Composite is currently the most commonly used filling material in dentistry due to its high strength properties, easy manipulation, no mercury toxicity concern and aesthetic reproducibility of a natural tooth. However, composite filling material is relatively more expensive in terms of cost as compared to other filling materials. During clinical practice, wastage of composite has always been noticed during restorative procedures as the dental operators and their assistants have a subjective perspective towards size of the tooth cavity. Dental assistants tend to dispense more composite filling material than the actual amount required for the restorative procedure as requested by the dental operators, resulting in wastage of the material. Sometimes, dental assistants are requested to dispense composite filling material several times before adequate amount is achieved, therefore slowing the restorative procedure. In the current market of dentistry, a product that is able to dispense the amount of composite filling material nearest to the exact amount based on the prepared cavity size is yet to be discovered. Thus, this project is initiated as a guideline to reduce the wastage of composite material in general dental practice by using a more objective approach to describe the nearest amount of composite filling material required during the restorative procedure. CompoWell is a reusable mixing well which has wells of different sizes for the dental operators to choose from based on the size of the tooth cavity preparation while the dental assistants dispense adequate composite filling material into the chosen well. The design of CompoWell is aimed to reduce the wastage of composite material in general dental practice by enhancing communication between the dental operators and their assistants regarding the amount of composite filling material required. The introduction of CompoWell indirectly brings benefit to the society as more patients can be treated with the same amount of composite syringe due to reduced wastage. At the same time, the restorative procedure is also smoothened as the cooperation, communication and teamwork between the dental operators and their assistants are improved, hence reducing the operational time on the patient.

Keywords: composite Wastage, CompoWell, restorative procedure
Abstract

Exca-Plus Instrument

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Operative dentistry and restorative dentistry are two elements that combine both art and science in order to treat and improve a person’s dentition which will involve not just function but also aesthetic and occlusion harmony. Dental restoration is a treatment to restore function, integrity and morphology of defective tooth structure resulting from caries or trauma. Restoring a tooth mainly requires two steps, which are; tooth preparation for placement of restorative material, and placement of the material into the cavity. Dental restorations often require multiple instruments which would cost a lot of money on purchasing different types of instruments, which indirectly cause more resources needed to create such instruments. Furthermore, having multiple instruments would mean taking up more space and time for sterilization process. Making multiple instrument into one or having a multi-purpose instrument would benefit in so many ways not just for the dental operator but also for the dental auxiliary team as it would be lighter and easier to carry during treatment in school and outreach programme, thus, needing less storage space and easier sterilisation process. The idea of inventing multi-purpose double-ended instrument combine function of dental caries excavation using excavator, and restoration of prepared cavity using plastic instrument and burnisher. This will definitely help dentists to place, sculpt and contour dental restoration’s material with complete ease, faster and more efficient. Moreover, minimizing production of different types dental restorative instruments would reduce the purchasing cost and more importantly, reduce environmental pollution due to less alloy used. This is also an approach towards sustainable and eco-friendly dentistry, creating a more effective and efficient service for the patient.

Keywords: instrument, multipurpose, restoration
Development of an Oral Health Education Booklet to Improve Oral Health Behaviours in Preschool Children

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The preschool oral healthcare programme was launched in 1984 by the Oral Health Programme, Ministry of Health with the aim to provide dental services and promote the oral health of preschool children in Malaysia. However, caries data from the National Oral Health Survey of Preschool Children 2015 showed that caries prevalence among 6-year-old children was high at 71.3%, much higher than the 50.0% ceiling rate targeted in the National Oral Health Plan 2020. Acknowledging the vital role of preschool teachers in promoting preschool children’s oral health, teachers’ active participation in preschool children’s dental education is paramount. However, suitable oral health education (OHE) tools for preschool children in Malaysia are not widely available. The objective of this study was to develop an OHE booklet for preschool children to be delivered by teachers as a teaching tool in classroom with the aim to improve oral health behaviours among preschool children. This booklet was developed based on collaborations between oral health specialists, a child psychologist, and experts in preschool pedagogy and assessment. The content was developed by dental public health specialists based on thorough review of the literature. It consists of 11 topics covering 6 domains related to oral health. The development of the OHE booklet followed the principles of Bloom’s Taxonomy to impart knowledge, understanding, and skills (cognitive, affective and psychomotor) to the children. The method of delivery and language used was verified by a child psychologist. The booklet was further validated by preschool curriculum experts from the Ministry of Education before obtaining feedback from preschool teachers on the overall appearance and ease of delivery to the children. The booklet is now being tested in an intervention study at 14 preschools in Kampar district, Perak for 6 months. Preschool children are expected to benefit from this booklet as it provides oral health education using an easy-to-understand language with various in-class activities for skills development and self-empowerment through direct teacher-children interaction.

Keywords: preschool children’s oral health, oral health promotion
Modified Bite Block Aiding in Suction Tip Placement

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The evacuation system is an essential component of most dental procedures. It aids in removing excess fluid and debris from the patient’s mouth. The two types of oral evacuation systems include saliva ejectors and high-volume evacuator. In four-handed dentistry, the dental assistant helps in the positioning of saliva ejector tip where required aiding in achieving adequate and optimal moisture control. Most dental patients in government dental clinics are requested to position the saliva ejector tip and hold it in place while operational procedures are carried out due to the reduced number of dental assistants. This has been a common complaint received from patients over many years as four-handed dentistry is not practiced in most government dental clinics thus needing patients to hold the suction tip. Patients complain of fatigue from holding saliva ejector in place throughout the procedure. Furthermore, operators are unable to achieve optimal moisture control and also have their visibility of the tooth being operated on compromised as patients are inexperienced in placing the saliva ejector. Patients occasionally choke due to pooling of water in their oral cavity, leading to overflowing of water out of the mouth. Hence, by creating a device that holds saliva ejector in place and with not requiring the patient or dental assistant to place it in position, would reduce the inconvenience caused to the patient and would overcome the need for dental assistant to hold saliva ejector in place. The proposed device would include a bite block with a section created to place the saliva ejector tip strategically which holds it in position. This device is cost effective as it could be made with existing bite blocks at dental clinics. The operator can position the tip as needed to achieve its purpose. With the ever growing technology in the dental world, such device would save time and manpower, requiring less from dental assistant, at the same time proving to be beneficial to operator, dental assistant and patient.

Keywords: bite block, suction tip, saliva ejector
School oral healthcare and outreach community project are major extensions in delivering oral healthcare services designed by Oral Health Program from Ministry of Health Malaysia. Dental healthcare workers will delegate the service through mobile dental team using portable dental unit. These programs necessitate portable items consisting of dental chair, dental unit, suction unit, autoclave, light unit and various dental instruments; these items needs to be mobile as it will be moved from one setting to another in conjunction with the programs outlined throughout the year. The current portable dental unit (PDU) is heavy which can cause back pain to the workers in long term. Besides, its large size consumes space in the vehicle which require multiple trips for the items to be moved and this is very time consuming. Moreover, it is difficult to maneuver the equipment in remote areas. This delays the planned tentative and reduces the coverage of community targeted to receive dental treatment which ultimately causes domino effect on quality of services provided to the community (eg: school children) and nation’s oral health status. Hence, the use of lightweight and compact portable equipment would be crucial. ‘E-Lite’ has a super light compressor compared to heavy conventional PDU, thus reducing the risk of back pain. The invention of `E-Lite` is user-friendly that enables dental healthcare workers to provide more practical and efficient dental services. Furthermore, the storage of compact ‘E-Lite’ occupies less space. Generally, the ‘E-Lite’ consists of four basic units; electric high speed handpiece, ultrasonic scaler handpiece, light-curing unit, and triple water syringe; which are compulsory for an effective dental treatment. The main feature of `E-Lite` is the electric high speed handpiece, which is used to replace the current conventional air-driven high speed handpiece. We aspire to invent a compact and practical PDU in order to improve mobile dental treatment delivery. Thus, it will make dental service delivery effortless; anytime anywhere. All Malaysians will have broader access to a more quality dental treatment and ultimately will ameliorate oral health status nationwide in years to come.

Keywords: lightweight, electric hand piece, portable dental unit
Clinical Database of Dental Traumatology for Paediatric Dental Patient

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Dental trauma is one of the most common causes for children attending paediatric dental clinic. It often requires long-term management and follow-up. Therefore, good record-keeping and clinical database is vital to ensure optimal patient care service delivery and future management of complication develop from present dental trauma. Currently there is no registry which maintains and manages the scheduled review of patients who have sustained dental trauma. The primary objective of this project is to develop an electronic database which retrieves data regarding traumatic dental injuries from IDeRMS. It will also include a well-structured dental traumatology clinical examination form to ensure standardized data collection. This project entails the development of a trauma evaluation and management form which will then be incorporated into the existing patient information management system, IDeRMS which was developed by the Faculty of Dentistry, UiTM. The examination and management of dental injuries is based on the recommendations by the International Association of Dental Traumatology which is the current golden standard for management. This database will facilitate clinical audits and retrieval of data for research purposes. The proper management of this database also ensures good record keeping which is essential for medico-legal purposes.

Keywords: Dental traumatology, medico-legal, electronic clinical database
Voice-Controlled, Rechargeable LED-Based Light Source Integrated with Protective Eye-Wear for Dental Illumination

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Good oral health helps to ensure overall health and well-being. The need for dental treatment is increasing gradually because of excellent dental health promotion which has improved oral health awareness. Yet, oral health has always been remained a neglected entity and there exist a dearth of knowledge and careless attitude in oral health among people in outreached and rural area. Positively, oral health education and basic dental treatment can be delivered to these people through community health programs. However, one of the many challenges in conducting such programs is the transportation of heavy and large dental equipment. Secondly, performing an intraoral examination during these programs requires adequate illumination. Portable light that are currently being used with the mobile dental unit is not as versatile as the light included in dental chair and pose additional transportation load and needs extreme caution to avoid breakage during transportation. It also requires electric plug points for functioning. Though these lights could be minimally adjusted into different angles to facilitate dental examination, they do compromise effective infection control and enable cross contamination during community programs. Headband mounted light source is an alternative solution, which, though solve the problem, but frequent manipulation of the light source with gloved hand may still compromise infection control. Also few dentists find it uncomfortable to wear a headband during screening. Hence to overcome all these shortcomings, the proposed prototype includes a voice-controlled, LED light source integrated with a protective eye wear along the line-of-sight. Since the light is integrated with eye wear it is simple, easy to carry and user friendly. The voice control and line-of-sight option avoids frequent manipulation of the light during screening hence, maintains effective infection control. This light source is cost-effective and can be utilized in regular clinics and during community outreach programs.

Keywords: dental light, community program, barriers, headband, oral health.
Making Jaw Relation Record Hijab-Friendly with Jaw-Reg Aid

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Many of the Muslim female patients who request for complete dentures wear hijab to cover their hair. During the complete denture fabrication, jaw relation record is a must. For this purpose, the posterior occlusal plane must be oriented parallel to the ala-tragal line. Commonly, a masking tape is adhered on the patient’s facial skin and inevitably patient’s hairline to mimic the ala-tragal line. In doing this, a clinician will have to repeatedly unveil the patient’s tragal to ensure the positioning of the line is satisfactory. This procedure may cause discomfort and embarrassment to the patient as the patient will have to pull back her hijab to expose their ears, which is a part of the female awra. On top of this, the placement, frequent movement and removal of the tape which sticks to the hairline is also not a pleasant experience for the patient as the usage of tape can cause irritation and sometimes pain. Thus, to resolve these issues we come out with a hijab friendly Jaw-Reg Aid which consists of a custom designed hijab and alar-tragal indicator (A-Ti). The hijab is designed with a slit at the tragal area to allow the tragal to be clearly seen allowing the A-Ti to be conveniently located in the ear canal. The A-Ti consists of earplugs that are attached to the adjustable, flexible wire used to orient alar-tragal line. This device is user friendly, both to the hijabi patients and also to the clinicians as once the anatomical landmark is located, the hijab does not have to be pushed back or lifted repeatedly as the necessary area can be exposed. Additionally, this aid can also be used for facebow transfer procedure while the A-Ti on its own can even be used for the non-hijabi and male patients. The novelty of this product is that it is a unique invention to ease jaw relationship record procedure for hijabi patients and non hijabi patients alike. The low production cost and wide applicability makes it suitable to be commercialized to be used in any dental clinic, dental schools both locally and internationally.

Keywords: alar-tragal line, earplugs, hijab
ABSTRACT

Data Analytics in Integrated Dental Record and Academic Module

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A significant amount of data is generated from patient’s oral health record and academic database via electronic applications. These electronic records especially, the patient and clinical records, are comprise of substantial details and contain various types of data in different fields of oral health care. The additional of academic module in the applications would put the data even more complex and transformed into a colossal entity. Due to this massive data set, the management of it is even daunting. Traditional software is unable to perform a significant task in its own platform. Therefore, there is a need to incorporate the software with data management tools and methods. We have developed an online dashboard system which comprise of two main components: patient record and academic module to cater to the needs of patient information management and clinical training module record. Due to the large data environment available in this system, we have built a platform for data visualization on the user request. Our approach by reconciliation of analytical tools with flexible process management and access to all required information into a single application - organisations can use big data to help convalesce the way they do business plus obtain a meaningful insight which help in making effective decisions.

Keywords: academic module, data analytics, oral health record
Oral Hygiene Health (OHH) Diary - Smart Gamification Innovation

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Dental plaque that harbors microorganism is one of the major factors that can lead to caries development. Mechanical and chemical plaque control can remove the dental plaque from the tooth surface. However, the effectiveness of tooth brushing in children has been a challenge to the parents due to their age, level of maturity and understanding of the proper brushing technique. In addition, the process of tooth brushing can be arduous and most of them refuse to spend significant amount of time to brush their teeth. Several studies suggest that gamification can increase the children's engagement to perform daily routines. It can motivate them to perform the gamified activities properly in a long run, it allows children to experience the feeling of making progress and to make them feel that they have achieved the goal. Our objective mainly is to develop and investigate the introduction of gamification in daily tooth brushing for oral hygiene improvement in school children. The novelty of this innovation is that there is no available diary incorporating gamification element that can be use as intermediary between parents, teachers and the children to facilitate oral hygiene practices. This diary will allow the children to record their brushing sessions and stickers are used to indicate their perception of the cleanliness after they brush their teeth. The provided stickers would make the whole brushing experience more exciting and this can motivate them to brush their teeth frequently. The children are allow to indicate their perception on the cleanliness after each brushing session and this will motivate them to brush their teeth correctly (i.e. more than 2 minutes for each session and to brush at least twice a day). This diary will benefit the children through tooth brushing gamification strategy to motivate them in performing good oral hygiene. This innovation will benefit the society by reducing the caries incidence in children and lower the risk of caries occurrence in the future.

**Keywords:** caries, children, gamification and oral hygiene
Dental Education Kit for Smokers (DEKS)

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In line with the Ministry of Health Malaysia campaign on stop tobacco use, dentists and the dental team played a significant role in its early detection and prevention. Dental Public Health Specialist Clinic team has developed a kit called Dental Education Kit for Smokers (DEKS), as part of the early detection and prevention of tobacco use. DEKS was developed in March 2018 and was since carried out on all smokers attending the quit smoking program. Smoking reduced the unstimulated salivary flow rate and could manifest xerostomia and would lead to many oral diseases and condition. Nicotine, a toxic addictive component in cigarettes may act on certain cholinergic receptors in the brain and on other organs causing neural activation leading to altered salivary secretion. A poisonous gas called carbon monoxide (CO) can be detected in smokers using a CO monitor with parts per million (ppm) reading and in blood haemoglobin (%CO Hb). Smokers knew about the hazardous of smoking on themselves, however without physical evidence they might not be convinced by it. Using these parameters together, saliva test kit and CO monitor, it may increase a smoker's motivation to quit smoking when it is used during a chairside brief advice or counselling session. It provides a visual aid to motivate smokers to quit and therefore, improve their quality of life.

Keywords: dentistry, education, kit, smokers
A State-Of-The-Art Wireless Bite Force Recorder using 3D Printing

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Background, problem statement and objective: The maximum bite force of an individual is one of the most important perimeter which correlate with the wellbeing of the oral health of a person. The measurement of bite force can provide useful data for the evaluation of jaw muscle functions and activities. It is also an adjunctive value in assessing the performance of a dental prosthesis. There are many bite force recorders in the market, however, the devices have many drawbacks in terms of accuracy, reproducibility, high costs, and infection control for intraoral application, which further limit its usage and effectiveness. The purpose of this innovation is to develop a wireless, cost effective and reliable bite force recorder device in which can be produced in-office using 3D printer. Novelty: Flexi force™ sensor system was used as the measurement tool for this device. The sensor was attached in the special slot at the biting gauge. The biting gauge was designed as disposable and can be easily produced using 3D printer. The design of the device was made light weight, wireless and can be connected to the mobile phone through Bluetooth connection. The consistency and accuracy of the bite force recorder was reaffirmed by doing a standardized laboratory calibration. Laboratory calibration was done and showed good linearity as well as excellent repeatability of the forces reading. Pilot study on human subjects is conducted to see the range of normal bite strength in adults. Benefit to user: A novel, reliable and economic bite force recorder device with a hygienic user-friendly design was successfully produced using 3D printer.

Keywords: bite force, biosensors, gnathodynamometer
ODsTree: A Novel Oral Diagnostic App

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Oral diseases (ODs) are complex pathologies that derive from the intersection of different components including oral microbiome, genomic, proteomic, environmental and behavioural factors and lifestyle. Globally, ODs are perceived as common non-communicable diseases that may adversely affect quality of life or result in mortality. Diagnosis of ODs is generally made by dental physicians through a comprehensive integration of the signs and symptoms of a disease, its clinical presentation and sometimes aided by radiographic findings. Achieving a correct diagnosis of ODs is critical in formulating an appropriate treatment plan for the patient as well as in predicting the treatment outcome and prognosis. In some cases, the diagnosis of ODs however is not facile. Overlapping clinical features of a range of ODs may lead to erroneous diagnosis and subsequent inappropriate management of the patient. Therefore, this project aims to develop a novel oral diagnostic App specifically designed to assist dental physicians to arrive at a definitive diagnosis where possible or narrow down to the most likely differential diagnoses in a clinical setting. The concept behind the App was largely based on decision tree algorithms in diagnosing oral medicine cases. Besides dental physicians, other auxiliary groups including dental students and general physicians would also stand to benefit from this App as it allows learning through web interface. In conclusion, this App is envisaged to greatly improve diagnostic skills among dental and general physicians as well as dental students while providing a better understanding of ODs presentations.

Keywords: oral disease, non-communicable disease, oral medicine, oral diagnostic
Green Light, Drink Right

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Introduction: Increased availability and consumption of sugary beverages in early childhood is associated with increased caries risk (Marshall et al., 2003). Peng et al., 2010 reported that while parents hold purchasing power, children have significant influence on their parents' purchase decisions, making it important for the children themselves to know what they should and should not drink even at a young age. Aim: The aim of this project was to capture the attention and interest of preschoolers in increasing their knowledge and awareness regarding drink choices through an interactive educational programme, 'Green Light, Drink Right'. Methods: An educational programme consisting of a short educational video, and an interactive model called 'Green Light, Drink Right' was developed. The model features 10 beverages popular with our target demographic of preschoolers. The beverages are randomly placed on a PVC model with a corresponding switch. When the switch is pressed, either a red, yellow or green light will light up depending on the category of the beverage picked. The red light denotes drinks with high sugar content and which should only be drunk rarely. Drinks that have lower sugar and can be drunk moderately corresponds to the yellow light, while drinks in the 'green- light' category are drinks that are encouraged to be consumed. This model allows the preschoolers to relate the simple concept of 'stop, look (careful) and go' of the traffic light to their drink choices. Results: Effectiveness of this programme was evaluated in 3 groups of preschoolers using a visual questionnaire. The pre-post test score showed a significant increase in knowledge and awareness among the preschoolers (from 42.9% to 80.2%, p-value< 0.001) rendering this programme a success. Conclusion: This project, utilizing the 'play-learning' concept, matches the cognitive abilities of preschoolers, improves learning and is an effective tool in increasing their knowledge on drink choices.

Keywords: beverages, play-learning, green light, sugar
Development of An Innovative Soft-Palatal-Gauge and Testing its Clinical Accuracy – A New Dimension to Clinical Prosthodontic

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Background: Based on the angle that the soft palate makes with the hard palate, three configurations have been recognized. However, these are diagnosed clinically by arbitrary method of visual inspection. Problem Statement: There is no objective method for assessing the soft palate angulation. Due to the subjectivity, it is a challenge for students and sometimes clinicians to accurately classify the soft palate. The gold standard for establishing the soft palatal angulation is the lateral cephalogram. However, in every case it is not ethical to subject the patient to additional radiation for the purpose of classifying the soft palate. Objectives: 1. Development of a soft palatal gauge which allows objective assessment of soft palatal angulation. 2. Test the accuracy of the instrument by comparing it with clinical perspective and lateral cephalometric tracing. Methodology: A soft palatal gauge was fabricated in metal using a novel technique. Thirty volunteers whose lateral cephalograms were available in the archives were selected and soft palatal angulation was measured by three examiners who were blinded to the study using three different methods (Palatal gauge, clinical perspective, Lateral cephalometric tracing). Results: Pearson’s correlation between lateral cephalograms and soft palatal gauge was 0.99 indicating a very high correlation. There was a very good strength of agreement between lateral cephalograms and soft palatal gauge with a kappa value 0.927. Descriptive analysis between all the three methods revealed a significant difference between clinical judgement and other methods. Conclusion: A high correlation was found between lateral cephalogram and soft palatal gauge readings. No significant difference between lateral cephalogram and soft palatal gauge readings was found. A significant difference in classification obtained from clinical perspective and the other two methods was found. Novelty, & benefits to society.: The soft palatal gauge adds a new dimension to the changing prosthodontic paradigms and may be of immense use to the clinician as it provides an objective assessment of the soft palate angulation. The gauge will have potential impact on management of palatal lift prosthesis, sleep apnea patients, patients with speech defects due to cleft lip and palate and fabrication of maxillofacial prosthesis.

Keywords: dentistry, soft palatal gauge, tool for measurement.
Prosthetic teeth come in sets. However, during the construction of a partial denture, not all teeth in the set were used. The dental technician will only choose the suitable tooth/teeth for that particular partial denture and left the other prosthetic teeth, unused. There have been piles of unused prosthetic teeth being left untouched for years, all jumbled up in a storage box. It was time consuming to select teeth to be reuse in such condition and technician tends to buy a new set of teeth for easier solution. This will incur additional cost. In order to overcome these problems, we proposed a method to reuse the leftover prosthetic teeth by creating a container that can ease in storage and aid in tooth selection. To date, this is the first ‘magic box’ ever designed. This innovative container will make the storage of the leftover prosthetic teeth more systematic, more cost effective as the teeth can be reuse and reduction of time taken in selecting teeth for dentures.

**Keywords:** reuse teeth, prosthetic teeth, storage box
ABSTRACT

Do-It-Yourself Tooth Fairy Kit

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Background: Dental caries is a common public health problem globally, affecting all ages including young children below 3 years. Dental caries affecting young children is called Early Childhood Caries (ECC). Studies showed high prevalence of ECC among Malaysian children with range from 36.6% to 74.5%. This high caries prevalence is often mainly due to factors related to the poor oral health care, limited use of fluoride, low parental awareness, nutritional deficiencies, and lack of oral health services. Problem Statement: Teaching young children and their parents of the importance of practicing good oral hygiene should start as early as the primary teeth erupted by starting with basic dental cleaning concepts and skills. Objective: This project aimed to teach the toddlers the concept of teeth cleaning in simple way and raise the awareness among the parents on the importance of starting teeth brushing for their young children as early as possible. Novelty: To the best of our knowledge, there has never been an educational tool such as do-it-yourself tooth fairy kit in the market demonstrating and explaining the concept of teeth cleaning to the toddlers. The available models are designed for older children. However, our target is the toddlers to start understanding and practicing good oral hygiene early. Benefits to Society: This project aims to educate the parents about their role on how they could help in preventing ECC using a simple, do-it-yourself item to teach their children the concept of cleaning their teeth. This environmental-friendly and cost-effective item would benefit not only the parents but preschool teachers as well. Moreover, it can be used and commercialized as an educational tool to promote good oral hygiene skills in toddlers.

Keywords: toothbrushing, toddlers, oral hygiene, dental health education
Poly(vinyl) Alcohol-multiwalled Carbon Nanotubes (PVA-MWCNT) as Potential of Oral Drug Carrier for Curcumin

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Background: A recent review has highlighted the paucity of both clinical and laboratory data on the role of Staphylococcus aureus and Streptococcus mutans in the oral cavity, where curcumin (Cur) has previously been shown to have anti-inflammatory and antimicrobial effects. In the search of new materials as drug delivery carrier for curcumin for application in dentistry, carbon nanotubes (CNT) are among the most promising candidate. Objective: This study was undertaken to identify the antimicrobial effect of curcumin by determining its minimum inhibitory (MIC) and minimum bactericidal concentration (MBC) against common microorganisms that causes oral infections, and to evaluate curcumin loading on multiwalled-carbon nanotubes (MWCNT) and its release efficiency in vitro. Materials and methods: Curcumin were purchased and were tested against the S. aureus and S. mutans using broth microdilution method. For the CNT experiment, pristine MWCNT (p-MWCNT) was oxidized with acids, and followed by functionalization with PVA. Systematic evaluation of curcumin loading efficiency on PVA-MWCNT was determined using adsorption kinetics and isotherm studies. Curcumin desorption from PVA-MWCNT was analyzed in PBS buffer pH 7.4 and 5.5 and was compared to that p-MWCNT and oxidized-MWCNT (ox-MWCNT). Results: The study revealed that curcumin exhibited bactericidal activities against S. aureus and S. mutans by providing MIC value of 2 mg/mL and 6.25 mg/mL, respectively. PVA-MWCNT had successfully adsorbed curcumin and desorbed it with a sustained release over 3 days of incubation at lower pH (5.5) than that of pH 7.4. It is suggested that weak binding interaction of curcumin by physisorption to the PVA-MWCNT has facilitated its release. Conclusion: It was found that curcumin demonstrated antibacterial activity against oral pathogens, and that PVA-MWCNT indicated as a possible carrier for curcumin, which suggests its potential as an alternative therapy for dental treatment.

Keyword: Antimicrobial, curcumin, oral pathogen, Streptococcus mutans, Staphylococcus aureus, poly(vinyl) alcohol-multiwalled carbon nanotubes
A Novel Mandibular Advancement Device for Management of Bruxing Patients with Mild Obstructive Sleep Apnea

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Background: Obstructive Sleep Apnea (OSA) is a sleep-related breathing disorders characterized by apnea despite continuing effort to breath. An association between OSA and bruxism has been suggested by multiple researchers. Mandibular Advancement Device (MAD) is an oral appliance used for management Mild OSA. Problem Statement: Despite multiple commercially available MADs in the market, none are suitable for bruxing patients as they are either too rigid to allow lateral mandibular movement or couldn’t withstand the bruxism effect. Objective: Fabrication of a custom-designed MAD for management of Bruxism with Mild OSA. Methodology: The MAD consists of a two-pieces appliance with friction type connector attached to its maxillary piece to allow mandibular advancement with minimally restricted lateral movements. A continuous screw-adjuster attached to mandibular piece to allow antero-posterior mandibular advancement. Novelty: The novelty of this MAD is, its two-piece separated design which was fabricated with heat-cured Polymethyl Methacrylate to endure the bruxism forces. It permits lateral movements with minimal restriction to reduce discomfort caused by bruxism and the possibility of antero-posterior adjustments for the purpose of mandibular advancement titration. Benefits to Patient: It provides solution for the failed and repeated breakage of commercially available MADs in mild OSA patient with bruxism. Reduction of OSA severity with protection of remaining dentition against bruxism damage can be achieved effectively with this appliance. Outcome: This Novel MAD is a cost-effective alternative, the fabrication is relatively straight forward and the design can be modified to accommodate patients’ dentition. It well-served bruxism patients with positive improvements.

Keywords: bruxism, mandibular advancement device, obstructive sleep apnea
Coleus blumei Extract as a Potential Antibacterial Oral Rinse for Peri-implantitis Patients

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Aim: Commercially available oral rinses, containing chlorhexidine as an adjunctive treatment for peri-implant diseases are not advocated for long-term oral care due to common side effects such as taste alteration and staining. Hence, the need for an alternative remedy that is able to reduce the side effects and is suitable for daily regime. The present study is done to investigate the potential of Coleus blumei to be used as antibacterial oral rinse with action against early colonizers in peri-implant diseases to prevent potential disease progression.

Methodology: Coleus blumei extract was screened for its antibacterial activity against Streptococcus mitis, Streptococcus sanguinis, Streptococcus salivarius and Streptococcus oralis, using disc diffusion method to find the Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC). Bacterial morphological changes were viewed using Scanning Electron Microscope (SEM). Results: Streptococcus oralis showed the lowest MIC and MBC value which is at 1.5625mg/ml (MIC) and 3.125mg/ml (MBC) respectively. Streptococcus sanguinis and Streptococcus salivarius, both have the same MIC and MBC value at 6.25mg/ml and 12.5mg/ml respectively and Streptococcus mitis have MIC at 6.25mg/ml with the highest MBC value at 25mg/ml. SEM images at 20000x magnification showed bacterial cell wall disruption that may explain for the inhibition of the individual bacterial colony.

Conclusion, significance and impact of study: These results suggest that Coleus blumei extract possesses antibacterial effects against early colonizers of peri-implant diseases that may benefit from investigations pertaining to their safety and further development for oral usages.

Keywords: Peri-implantitis, Coleus blumei, antibacterial activity, oral rinse
A Novel Histochemical Biomarker in Oral Cancer: DEF6

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Oral cancer is one of the tenth most common human malignancy, not only in developing countries but also in developed countries. DEF6 gene which is located in chromosome p21,31 was found mainly in lymph node, thymus and peripheral leucocytes contributes in DNA recombination of T and B cell function and lymphoid development. DEF6 has role in regulating cell shape, polarity and movement and also shortening G1 interval and increasing cyclin D1 expression in human cell cycle that leads to cell proliferation. Elevated DEF6 expressions were commonly observed in autoimmune diseases, some cancers and chronic inflammatory diseases. 50 formalin fixed paraffin embedded tissues (FFPET) of oral cancers and 1 normal oral mucosa tissue obtained from Dental faculty, University of Malaya (Malaysia) were used to detect DEF6 protein expression by using immunohistochemistry (IHC) method. IHC staining were performed manually by using DEF6 antibody from Abcam (1:300) and analysed semi-quantitatively. Our research found DEF6 expression in oral cancer significantly compared to normal oral mucosa (p<0.05). This novel research detect DEF6 as one of biomarker for oral cancer and give significant finding in determining prognosis and targeting therapeutic agent for oral cancer treatment in the future. DEF6 also plays important role in carcinogenesis of oral cancer.

Keywords: biomarker, DEF6, histochemical, oral cancer
Sterile Surgical Head Cover for Hijab Wearing Clinicians: A Prototype in the Making

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Objective: The guideline states the need for head cover to be used when carrying out surgical procedure. For hijab wearing clinicians, the current options for the sterile hijab covering are limited with many shortcomings. Our innovation focuses on the simple, easy, comfortable and Syariah compliant design of sterile hijab cover whilst maintaining the best infection control during surgical procedure. Methodology: Multiple designs and potentially suitable materials were evaluated. The main factors considered were practicality and comfort. The criteria to be fulfilled are easy to wear with one or minimal step application, one-size-fits-all and breathable material. The chosen materials were tested through multiple sterilization cycles to test the resilience and resistance of the material for long term usage. Two short surveys were conducted to look at the awareness on the need of sterile hijab coverage in surgical procedure and to choose the most suitable prototype that caters to the needs. In conclusion, the reason for the innovation are to fulfil the gap present in the need of suitable design for sterile surgical head cover for hijab wearing clinician. This is in line with the steady increase of hijab wearing clinicians empowering them to excel in their area of expertise.

Keywords: hijab, sterile, surgery, operation room
An Innovative Method of Producing a Digital Dental Library

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Computer aided design (CAD) systems are known for their fast, interactive response and graphic display. Understanding the function and application of the CAD system in designing products or models is crucial in order to fully operate the apparatus. The system consists of a scanner that transforms geometry into digital data that can be processed by a computer. The data then can be manipulated or measured with proprietary software. Understanding this vital procedure of the system enables the user to have a digital record library. Few researchers have reported on tooth dimensions, however the difficulty in recording poses a challenge for such studies to be done. Traditionally, the method of choice has always been the use of a digital caliper, as well as radiographs by other researchers to determine the tooth sizes. Digital calipers require a study model to be fabricated which necessitates a storage room, whereas utilizing CAD only requires a digital storage and simulation with a computer. Radiographs on the other hand expose patients to unnecessary radiation and results remains inconclusive. The main objective of this project is to prove that CAD scanners is a viable alternative method to measure tooth dimensions. This is an innovative method to acquire tooth dimensions without the need of physical storage. This will reduce the cost of recording of tooth dimensions as there is no need for storage facilities. The main advantage is the creation of a digital library that may be used by practitioners to digitally fill spaces and fabricate prosthesis with Computer Aided Design and Computer Assisted Manufacturing (CADCAM) machinery.

Keywords: CADCAM, digital profilometer, tooth measurements
Background: Bimaxillary protrusion (bimax) is a common physiognomy seen among Asians and Africans which is characterized by proclined upper and lower incisors and an increased procumbency of the lips. Bimax patients display varying profile convexities and that the degree of severity depends on their ethnic background. Many patients seek treatment to reduce this procumbency and improve their facial appearance. The usual practice of using Index of Orthodontic Treatment Need (IOTN) to identify patient’s need are based on the Caucasian descent and does not consider patients with bimaxillary protrusion. These patients who might score low in the IOTN may actually perceive their needs to be higher for treatment. Thus, it does not fully translate into the needs of this bimax population. Problem Statement: Many studies described bimax among their population, but none have analysed this protrusion as an entity looking in detail its aspect in skeletal, dental and soft tissue presentations and categorizing into different range of severity. Thus, the assessment of this feature is difficult and subjective, and it is very much based on visual assessment without any screening tool to guide the assessor to some level of accuracy. Objective: To classify the skeletal and dental cephalometric measurements of bimaxillary protrusion into severity grades and to develop a bimax screening indicator tool. Novelty: Cephalometric measurements has been classified according to different grades of severity of bimax and has been objectively translated into a new screening tool namely the bimax indicator prototype. Benefit: The prototype can be used by dental students, academicians, researchers and practitioners as a reference and, a quick and easy guide to provide an objective assessment. Conclusion: This systematic categorization of cephalometric measurements and the development of bimax indicator prototype aid easy identification, guided evaluation and proper treatment delivery for bimax patients.

Keywords: bimaxillary protrusion, lateral cephalometric radiograph, orthodontic treatment need
Innovative Eco-Friendly Denture Adhesive for Dental Application

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The commercialized denture adhesives are mostly made up from synthetic polymer, polymethyl vinyl ether-maleic anhydride (PVM-MA) that theoretically provides good mechanical properties and also made up from natural resources such as petrolatum that were claimed to be environmental and user friendly. However, during application, the commercial denture adhesive had showed lacking of bonding to denture base due to low adhesiveness and it was oily when it came to the application and cleaning of the denture. Besides that, prolong used of denture adhesive can lead to oral lesion. Hence, an innovative eco-friendly denture adhesive filled with starch a natural occurring polymer has been introduced to overcome the limitations of current denture adhesive. The starch is known as environmental friendly, renewable, low cost, abundant, well established adhesive that give good adhesion and easily obtained. The newly developed eco-friendly denture adhesive has enhanced mechanical properties; tensile bond strength, adhesiveness and hardness as compared to commercialized denture adhesive. The elimination of petrolatum can also remove the oiliness and disease symptoms. Thus, the comfort of patient during applicant and denture removal is significantly improved. Furthermore, eco-friendly denture adhesive is biocompatible and nontoxic to human gingival fibroblast (HGF) cells. Clinical study on 12 human subjects showed eco-friendly denture adhesive give consistent improvement in the retention of complete denture after 2 hours of fasting with a statistically significant (p < 0.05). Moreover, study on maximum occlusal bite force in new complete dentures with denture adhesive has been carried out on 10 edentulous subjects with new maxillary and mandibular complete dentures. The result of this study confirmed that the usage of novel eco-friendly denture adhesive significantly improved the biting forces in new complete dentures. The results demonstrate beneficial and suitability of eco-friendly denture adhesive for dental application as it showed better mechanical properties, good retention, biocompatible and nontoxic. This invention has very huge potential to be commercialized as the global dental adhesive field is expected to grow at a CAGR of 6% through 2021.

Keywords: denture adhesive, denture retention, eco-friendly starch, tensile bond strength
Background: Bimaxillary proclination or protrusion (bimax) is characterized by proclined upper and lower incisors, increased in procumbency of the upper and lower lips and may or may not be accompanied with incompetent lips. This feature is commonly seen in African-American and Asian populations. Cases with only bimax feature was difficult to assess using the current Index of Orthodontic Treatment Need (IOTN), thus not favourable to be used for Asian populations displaying the bimax feature. Problem Statement: Bimax may present with different degrees of severity and can be difficult to assess objectively because there is no index or guide to ration or prioritize its treatment. Objective: To categorize the severity and develop a Bimax Index specific to bimax populations. Novelty: Bimax Index is being developed to grade the bimax features in categories of severity: B1(mild), B2(moderate), B3 (severe). This index can be used globally across all populations with bimaxillary protrusion. Benefit: The index can be used by dental students, researchers and practitioners as a reference and quick guide for treatment need and delivery. Conclusion: This index can be a useful tool to prioritize treatment for bimax population, aid in treatment planning and obtaining informed consent from patients.

Keywords: Bimax Index
Prolonged bleeding after tooth extraction is a common encountered complication in dental practice. Persistent bleeding in the mouth is uncomfortable and terrifying to patients leading to multiple trips to the emergency department at the hospital when most bleedings can be stopped with simple compression. Post-operative instructions that are properly delivered are found to be able to decrease side effects such as stress, anxiety and pain in patients who underwent dental extraction. It is also a relevant tool to educate patients on home care after dental extraction. However, verbal instruction alone might be inefficient for patient to remember multiple instructions. Therefore, the objective of this novel Patient Education Kit: Post Extraction Care (PDEC-kit) is to provide dental students and dentists with relevant tools to simplify educating patients who underwent dental extraction on care after a dental extraction. This kit comprises of an educational video, pamphlet with detailed instructions that can be brought home by patients, a model of tooth to educate on manual compression and flashcards to help not only with audio but also for visual guide and aids for patients. This information will also be easily accessed through a QR code online. This education kit is useful not only to help alleviate simple complications after extraction for patients but is also useful as an educational tool for dental students and dentists to practice their rapport with patients in their clinical practice. Hence, this kit could potentially decrease the unwanted complications and improve patient’s quality of life after the tooth extraction.

Keywords: patient education kit, post-extraction care, tooth extraction
ABSTRACT

Greenster: Border Moulding Made Easy

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Border moulding is an essential step for the construction of complete or partial denture in the edentulous area. The low fusing impression compound such as tracing greenstick is a common material used to record the width and depth of the functional sulcus. In order to manipulate the greenstick tracing wax, it needs even heating by twisting and twirling the wax onto the direct flame. Using direct flame may burn out the tracing wax and may affect its properties. The uneven temperature on the flame may also cause uneven diffusion of heat on the tracing wax. This might affect the impression of the functional sulcus. Apart from that, when the tracing wax becomes too short, the clinicians usually just discarded it and it will be a waste to the clinic. The innovation of Greenster may help the clinician to overcome two problems; the uneven heat of tracing wax that may affect its property and reduce the waste of greenstick. Greenster was inspired by the incorporation of hot glue gun, coffee machine and also juice presser. Greenster helps to ease the handling of the tracing wax by providing even heating and thickness of the greenstick without using direct flame. Besides, it helps to reduce the waste of materials and the whole greenstick can be fully utilised for border moulding. Greenster provides a faster and more efficient method which benefits both clinicians and patients as it eases the border moulding procedure in complete denture.

Keywords: border moulding, denture, secondary impression.
A variety of malocclusion is present in the population and most of them will result in a favourable treatment outcome if treated at the optimal time of life. If the developing malocclusion is successfully intercepted early, orthodontic intervention provided may negate the need for future orthodontics. Hence, it is proposed that children are taken for an orthodontic assessment as early as 8-10 years of age, to enable recognition of any developing malocclusion and to allow timely provision of interceptive orthodontic treatment if deemed necessary, kept under regular monitoring or urgent referrals to designated specialty. Although, dental screening is carried out on children between pre-school and secondary school in Malaysia, several malocclusions are missed during the screening and left to be treated later than ideal, which eventually, results in a more complicated treatment plan and at certain times, this can lead to a compromised outcome. This delay in identification or referral may be attributed to the large number of children that need to be screened at school or at dental clinics by the dental personnel, who are lacking in numbers, shortage of facilities and time constraints. Commonly used Index of Orthodontic Treatment Needs (IOTN) is based on the permanent dentition, and several malocclusions are not included. The objective of Index of Malocclusion in Mixed Dentition (IMMD) is to facilitate the detection of a malocclusion in the mixed dentition stage in a timely manner and to decide if there is any need for interception, monitoring, or referral to the respective personnel. The novelty of IMMD is that it is able to detect the developing malocclusion early before it is too late for any interceptive orthodontics to be beneficial. Indirectly, this early detection and management of malocclusion in the mixed dentition will be faster and cheaper, both to the patient/family and to the dental institution, resulting in a more predictive outcome.

**Keywords:** index, mixed dentition, malocclusion, referral
ABSTRACT

Tannic Acid in Promoting Post Tooth Extraction Haemostasis

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Tooth extraction is a common procedure done at dental clinics. Normal post-extraction haemorrhage is inevitable within the first 30 minutes and subsequently, blood-tinged saliva up to 8 hours. Principally, haemostasis can be achieved by applying direct pressure with gauze onto the socket. Some patients may encounter prolonged haemorrhage, particularly when at home. Traditionally, tea bags were suggested as a remedy for self-haemostasis. In our study, we postulated that combination between pressure exerted by biting on gauze and the effect of tannin will act synergistically in reducing duration of haemostasis. Tannin from the tea-extract is able to stabilise and expedite the haemostasis process via the action of vasoconstriction of the blood vessels. Scientific evidence proves that tannin has biocompatibility effects but is not widely used as a pharmacological haemostatic agent. As per previous studies, 3 extraction phases were performed to maximise the yield of tannin. Solvent extraction was done to produce an aqueous solution prior to isolation of caffeine in the second extraction phase. Tannin content was determined by using Folin Denis Reagent and subsequently, supernatant was freeze-dried to powder form. The powder obtained can be stored up to 2 weeks at 4°C Celsius in order to preserve its active components. Ongoing laboratory work to determine concentration of tannin in view of experimental thrombosis shows that there are comparable effects on haemostatic parameters. Furthermore, tannin is beneficial as it has a placebo calming effect, increasing patient’s comfort and is non-toxic. We aim to produce a commercialized, medical-grade, and sustainable haemostatic agent that can be used by dental professionals at dental clinics and by patients at the comforts of their home. Hence, in line with enhancement of dental services and patients’ quality of life post dental extractions, a randomized controlled clinical study will be conducted in Phase 2.

Keywords: dental extraction, bleeding, tannin, haemostatic agent
Conceptual Design of Oral-Health Mobile Game (OhMG)

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Background: Children are exposed to proper dental care through parents, schools, and government initiatives and campaigns. Even so, exposure does not equate practice. Good dental habits need to be instilled in children from young and while these children are equipped with the knowledge, they need to be monitored and encouraged to continue practicing what has been taught. Gamified methods have been proven to motivate users with continued engagement when implemented on a learning platform. Hence, adapting a gamified approach towards educating and instilling good dental habits would appeal to children. Problem statement: Dental caries is one of the most prevalent preventable diseases worldwide yet children in Malaysia are still facing the problem. The number of treated dental caries is high during latter years due to the impact made by the incremental dental care program. Even so, it is essential that children are aware of the consequences of high sugar consumption and incorrect brushing to prevent the problem from occurring. Objectives: This project is aimed to design and develop a platform to disseminate oral health knowledge and dental care skills among children from 6-12 years old. Novelty: Through Oral-Health Mobile Game (OhMG), users will learn dental knowledge within a game environment. The learning content is embedded within the game design, hence the user will be intrinsically motivated to use and learn from the game. Benefits to user: This app will utilize the benefits of gamification to keep the users engaged with the learning process and eventually form positive oral habits. Conclusion: OhMG is designed to appeal to young children and will function as a learning, gaming, and monitoring tool to help them practice good dental care.

Keywords: mobile application, oral health education, children edutainment, gamification
ABSTRACT

OPath3D: A Novel 3D Histological Model for Interactive Oral Pathology Learning

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Traditional approach in teaching oral pathology subject has long been practiced over the past decades by which the learning process is converging towards teacher-centered and frequently conducted in one direction. In the 21st century, this approach is perceived to have limited potential to create motivated and active learners, but rather bore passive learners in the usual classrooms. This is particularly true for oral pathology subject as it is substantially theoretical with overwhelmed conceptual content. In recent years, education has undergone important paradigm shifts including the shift from teacher-centered to a student centered learning and the replacement of the traditional practice of learning over a period of time by the concept of lifelong learning. In view of this, a number of interactive platforms have been invented in the education world to foster such new age learning culture. The purpose of this project is to innovate a novel 3-dimensional (3D) histological model specifically designed for oral pathology education among undergraduate dental students. The model is anticipated to nurture interactive learning among students and is conveniently used inside and outside the classrooms.

Keywords: oral pathology, interactive, 3D
Optimization of Scanning Parameters in Dental Panoramic Tomograph and Lateral Cephalograph Acquisition for Adult Orthodontic Patients

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Background: Dental panoramic tomographs (DPT) and lateral cephalographs (LC) are routinely taken to aid orthodontic diagnosis and treatment planning. The increasing needs for dental x-rays over the recent years has raised concern over the stochastic effects as this will predispose patients to radiation exposure which may cause cell damage and increase the risk of oral carcinoma. In accordance with “as low as reasonably achievable” (ALARA) principle, it is necessary to develop strategies to optimize x-rays dose parameters. Problem Statement: Every radiograph machine has different dosage parameters prescribed by the manufacturers according to its individual type and brand. Ideally the efficacy of dose parameters prescribed on each radiograph machine should be tested before being used on patients. Currently, the standard x-ray doses are provided by the manufacturers and its efficacy has never been proven. Objective: A study was conducted to develop an optimized dose parameter of DPT and LC for adult patients and also to evaluate the quality and diagnostic values of images taken using different radiographic parameters. Novelty: The development of optimized dose parameters of DPT and LC for adult patients. Benefits: This study is very important to ensure that an optimized and lower dosage is used when taking DPT and LC for adult patients without compromising the quality of the images. This will inevitably reduce the stochastic effect of radiation and will minimize the risk of oral cancer. Conclusion: Based on this study, a reduction of 45% for DPT and 25% for LC optimized dose can be applied on the radiograph machine when taking radiographs for adult patient without compromising its data quality. This can also act as a guide to test the efficacy of the dose parameters used on all other available radiograph machines as well as new machines before being used on patients.

Keywords: dental panoramic tomogram, dose reduction, lateral cephalogram
Orthodontic Flipbook: Present Broadcast, Future Forecast

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Background: Orthodontic diagnosis and treatment planning are two dynamic processes, which is very important to formulate a comprehensive course of treatment based on the initial patients' dentoalveolar presentations. Diagnosis covers the problems with the bite and malocclusion, symmetry issues, jaw position and growth. The treatment plan is then developed to address the issues exhibited in the diagnosis. Patient needs to know the proposed treatment options and risks before making final decision about their course of treatment. Problem statement: Both processes are essential to be discussed in detail with reference to x-rays, models and patients' photographs, which were taken during the study records visit. Sometimes various orthodontic treatment mechanics and specific appliances are not readily available in dental clinics to show patients directly. This could lead to some communication problems that could affect decision making and informed consent taking. Objective: This flipbook can be used as an effective adjunct aid to provide a thorough analysis of the problems, proposed plan with options, risks and limitations during orthodontic consultation. Novelty: The first printed systematic infographic flipbook on orthodontic diagnosis and treatment planning illustrating both skeletal and dental malocclusions with different treatment modalities and options. Benefits: Utmost helpful in the decision-making process and increase patient's understanding of orthodontic treatment plan. Patients will be able to apprehend all treatment options with its advantages and disadvantages before deciding on the treatment course. This is expected to increase patient’s cooperation and trust towards orthodontist and treatment. Apart from that, medicolegal issues can be prevented, as well as helping to ease the inventory procedure by reducing storage need of multiple different model appliances.

Keywords: orthodontic flipbook, orthodontic diagnosis and treatment plan, printed infographic of orthodontic appliances.
Ortho Tap App: Information at the Tip of Your Fingers

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Background: Daily chores are now directed towards being paperless and completely electronic based. All these have been made easy just to fit into our hectic life schedule and this is no different with learning. As we progress forward into 21st century, learning has transformed itself from the old didactic conservative method of using textbooks and one sided lectures to a more blended form of learning such as using apps, videos and webinar. These applications help create an exciting environment and appears to be an effective tool for learning at any level. This advanced method is also to cater for the current generation who are more adept to using gadgets such mobile phones and tablets as modes of learning. Problem Statement: There are many downloadable apps on Orthodontics, but mostly are brief and there is not one which has a comprehensive information on orthodontics. Objective: This app was built as a faster and easier tool of getting information of orthodontics at your fingertips and also aids students in learning leading to better diagnosis, management and care for their patients. It can also be used as a reference guide for dental practitioners as well as patients. Novelty: A more comprehensive Orthodontic App. Benefit: The app can be used by dental students, practitioners and even laymen as a reference and a quick go-to-guide on Orthodontics. It is beneficial for the general public as it can help to educate patients and increase patient cooperation which can lead to successful treatment outcomes. Conclusion: This app could serve as a tool to enhance dental students' learning experience. Dental practitioners can also benefit from using the app in their daily clinical work both as a quick reference and as a patient education tool.

Keywords: orthodontic, mobile app, orthodontic app
ABSTRACT

Apps for Dental Students: ptGo

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One of the aims of the dental curriculum is to train the dental students to provide patient centered comprehensive care. As a student, their focus is mainly towards completing the predetermined clinical schedule prior to graduation. This behavior may lead to patient negligence. Negligence is considered as unprofessional and unethical behavior. In order to avoid patient negligence, dental planner and organizer has long been used to record and monitor patient’s appointments. However, this method may be a hassle if the planner is damaged or gone missing. Nowadays, smartphones and gadgets are slowly replacing planner and organizers. Nonetheless, their usage is still considered limited. Thus we intend to aid students in planning their journey of clinical years by providing a mobile phone application called ‘ptGo’. ‘ptGo’ is a mobile phone application designed especially for dental students to organize their routine patient management as well as monitoring their clinical requirements. The use of this smartphone app gives a lot of benefits to dental students. This app is able to help dental students by providing a mobile app with the content of calendar, clinical schedule, lists of requirements for each dental discipline, and records of patients’ treatment. Students are able to keep trac their patient treatment status using the apps, by recording and updating it regularly. It eases students in managing patients anywhere, anytime at their fingertips. Diary and planner consume trees and papers while 'ptGO' is a smartphone application, which can reduce and eliminate the use of paper. Hence, it is considered economical and more environmental friendly. In short, 'ptGo' features a practical, useful and simple user interface that gives a lot of benefits to dental students.

Keywords: dental application, patient management, smartphone apps
In dentistry, Enterococcus faecalis is a hard-to-eradicate pathogen and mostly found in root canal endodontically treated teeth. Studies found that, Calcium hydroxide (Ca(OH)2) can no longer eliminate this microorganism. Research found that Malaysian propolis (MP) and Aloe vera (AV) alone able to inhibit E. faecalis which can substitute Ca(OH)2 as a new intracanal medicament. Hence in this study, we hypothesized that combination in between MP and AV has better antimicrobial effect against E. faecalis. Objective: To determine the antimicrobial activity of MP, AV and MP+AV in comparison with Ca(OH)2 against E. faecalis as Intracanal Medicament. Materials and Methods: Antimicrobial susceptibility testing (AST) via agar well diffusion method was done on five samples: MP; AV; MP+AV; Ca(OH)2; and sterile distilled water. The minimum inhibitory concentration (MIC) was determined on 96-well plate and measured by microplate reader. Once MIC were recorded, MBC was undertaken by streaking sample mix out of wells where inhibition was apparent, onto Muller Hinton Agar plate. The results were analyzed by Kruskal Wallis test with Mann-Whitney post-hoc test and repeated measures of analysis of variance (ANOVA) with Bonferroni post hoc test (p <0.05). Intracanal medicament from Malaysian propolis and aloe Vera gel prepared in plastic bottle of 50 ml. Results: MP+AV (2mg/ml) concentration can produced better antimicrobial efficacy followed by MP, Ca(OH)2 and AV. Conclusion: Among the natural intracanal medicaments, MP+AV consistently showed good inhibition, however AV alone showing minimal antimicrobial activity. This GEL could be of great benefit to the society because it is Halal, cheap with no side effects.

Keywords: Malaysian Propolis, aloe vera, intracanal medicament, antimicrobial, Enterococcus faecalis
Classification of Bimaxillary Protrusion Severity: A Geometric Morphometric Analysis as an Adjunct Screening Tool in Orthodontic Treatment.

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Background: Bimaxillary protrusion is a condition characterised by an increased procumbency of the lips and proclined upper and lower front teeth. It is commonly seen in Asian and African-American descent and associated with anterior open bite, gummy smile and lip incompetence. Bimax patients present with a variation of profile convexities which could be graded in different severities. Treatment options for these patients usually depend on the severity of occlusion which are mild, moderate and severe. Instead of manually classifying the severity by clinicians, there is an alternative advanced method that can be used which is geometric morphometric analysis. Geometric morphometric analysis (GMA) is a method that uses anatomical landmarks to quantify its biological form and it is one of the tools that can analyse morphological characteristics. From this study, a database of the Malaysian bimax population is built to design a diagnostic tool that is able to classify bimax via GMA. Problem Statement: The assessment of bimax feature is time consuming and subjective, and it is very much based on analysis of visual assessment, skeletal, dental and soft tissue presentations. Currently classification of bimax is conducted by manually calculating angles of lateral cephalographs and clinical judgements by clinicians to conduct diagnosis and treatment plan. Objective: To classify the craniofacial shape and size in bimaxillary protrusion morphology according to its severity by application of geometric morphometric technique to be used as an alternative diagnostic tool. Novelty: Mean coordinates of cephalometric landmarks has been classified according to the severity of bimax to form a database catering to the population and has been objectively translated into a new screening tool via the geometric morphometric method. Benefit: The software can be used by dental students, academicians and practitioners as a quick and inexpensive adjunctive tool to diagnose and classify bimax according to its severity. Conclusion: Geometric morphometric analysis can be used as an alternative tool to classify bimaxillary protrusion patients according to its severity.

Keywords: GMA, BIMAX, orthodontic, screening tool
The improper posture while using gadget has direct health impact on the musculoskeletal system. Forward Head Posture (FHP) may develop in the patient who exposes to early onset of the non-ergonomic position and/or long-term use of gadget. FHP may lead to many other disorders such as temporomandibular disorders and hunchback. Early detection of FHP may help patient to prevent further damage of the non-ergonomic position. FHP is usually determined through the translation and the craniovertebral angle (CVA). Translation of FHP can be measured using Cervical Range of Motion (CROM) device and photograph method. While the CVA value can be measured using the analysis of photograph, radiograph and combination of CROM with goniometer. However, inaccuracy of CVA value may arise because the difficulty to stabilize patient’s head at rest position and to stabilize the goniometer while taking the measurement. Thus may lead to parallax error of the value. Apart from that, the radiographic method will expose the patient to unnecessary radiation. GONIOPLUS invention helps the clinicians to obtain an accurate measurement of CVA. Therefore, GONIOPLUS was introduced to overcome the inaccuracy of the CVA measurement in FHP patient and made the procedure more practical. It was a modification from the conventional goniometer with additional features. Both adjustable horizontal arm and rotating arm of the GONIOPLUS indicated to the points of the tragus and cervical C7 which are the important landmarks in measuring CVA. GONIOPLUS stabilize the head at rest position and hold the goniometer steadily using the balanced water path. Hence, the combination use of CROM device and goniometer can be replaced by GONIOPLUS. GONIOPLUS invention may help in diagnosing FHP’ patient with safe and cost-effective method.

Keywords: ergonomic, forward head posture (FHP), craniovertebral angle (CVA), goniometer
Vizimag- Visualization and Magnification Made Easy!

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Background: The practice of dentistry involves laborious high finesse dental preparation, precision and control in executions that require a particular attention, concentration and patience of the dentist and finally the dentist’s physical and mental resistance. All along, round-shaped mouth mirrors have been used as a standard tool despite their limitations. It has limited field of vision covering approximately a single tooth and causes fogging and pooling of water during tooth preparation. Problem statement: To date, several modifications of mouth mirrors were made to tackle this matter, such as modifying the size and shape but none of it combines the features of wide viewing field, magnification and anti-fogging. Efforts were made to increase magnification of the working field by using dental loupes and intraoral camera but these tools are costly and unaffordable to many, especially undergraduates. Objectives: Our objective is to enhance visibility and accessibility during dental treatment as well as providing magnified view of the preparation for teaching and clinical purposes. Novelty: ViziMag is a combination of a rectangular intraoral mouth mirror and a tri-fold extraoral mirror with magnification. The intraoral mirror has antifogging mechanism with a wide viewing field. On the other hand, the extraoral mirror allows a magnified view of the intraoral preparation from different angles. Benefits: ViziMag is useful for teaching and demonstration purposes as well as in clinical practices. In teaching and demonstration, ViziMag offers easy visualization with the rectangular intraoral mirror and a magnified reflection of the image allows students standing in different angles around the operator to see clearly. In clinical practice it is user friendly, has an anti-fogging mechanism and provides clear visibility during usage of airotor. The mirror sizes are customized to the different arch sizes. Visualization of intricate details of cavity preparations and abutment parallelism becomes easy and feasible. Not only these, ViziMag provides adequate tongue and cheek retraction. The rectangular intraoral mirror and also the magnified extra oral mirror can be used for dental photography ensuring patient comfort.

Keywords: magnification, visibility, ViziMag
Photodentistry - An Innovative Approach to Improve Students' Empathy and Learning Experience in Comprehensive Patient Care

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Training in development of empathy and comprehensive management of patient is essential to prepare future dental graduates for providing quality professional care. This project involves development of an innovative educational method that is proven to be effective in enhancing dental students’ empathy and educational experience in Comprehensive Care Dentistry. The innovative teaching and learning activities include interpretation of street photographs using guided questions, followed by group discussion using a facilitator guideline. This novel educational approach is cost-effective and practical with potentials for business development and widespread use in healthcare and higher learning dental institutions. The project was developed by academic experts in dentistry, arts, education and psychology. Improvement in students’ knowledge, skills and attitudes demonstrated by students who participated in this educational program would lead to an improved standard of patient care, especially for those with special health care needs and the underserved population.

Keywords: empathy, comprehensive care, dental education
ABSTRACT

Child’s Diet & Caries

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Early childhood caries (ECC) is a preventable, infectious oral disease that remains as a major public dental health problem internationally. In Malaysia, the prevalence of dental caries is between 70-90%. This has been observed to be increasing in the last couple of years. There are various factors that contribute to the occurrence of dental caries such as lack of awareness and knowledge, dietary intake, oral health behavior, oral hygiene practices and lifestyle habits. The objective of this prototype is to educate the public especially parents in prevention of early childhood caries by providing the basic guidelines and materials to the parents in making informed decision with regards to nutritious food and drinks for their children. Novelty: The concept of this prototype is a vending machine filled with cariogenic and cariostatic foods, and the consequences of consuming them. It also comes with guidelines and pictorial information of healthy food and drinks for children to prevent the occurrence of caries. All commercially available vending machine are only filled food or drinks without any information on its nutritious values and/or the consequences of the consuming the food and/or drinks. Benefits: This will increase the parents’ and/or caregivers’ awareness and knowledge on nutritious food and drinks and eventually will empower them to regulate when and how often their child is exposed to cariogenic food or ‘sugar hits’. Conclusion: With the knowledge of relationship between diet and dental caries development in children, parents and/or caregivers will be able to regulate their child’s cariogenic food intake and eventually prevent early childhood caries.

Keywords: ECC, early childhood caries, caries in children, caries; diet
Development of a Mobile Application as an Aid for Tooth Brushing Advices

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Introduction: There is a lot of oral health education tools available aiming to help reducing the burden of disease brought by dental caries. Health related mobile apps is considered one of the appropriate tools that has a wider and quicker reach to the end user. Efforts in creating an appropriate tooth brushing advice tool as a part of living skills to children that utilizes the benefits and simplicity of a mobile application need to be developed. Problem Statement: With the high percentage of smartphone users in Malaysia, we as advocate in oral health should take this opportunity to use this platform to develop an interactive mobile app that is user friendly for children and parents in order to instill positive behavior towards optimum oral health. Evidences has shown that by using interactive tools in providing health or oral health education can improve the awareness and knowledge among the users. In Malaysia, oral health neglect is still apparent as dental decay and gum diseases are still very common in children. This shows that we need to develop new tools for oral health education to improve the knowledge and awareness among children and their parents. Objective: This project aims to create a mobile application that incorporates appropriate tooth brushing advices that is interactive and user-friendly to children and their parents. Benefits to society: This mobile application hopes to benefit children and their parents as it can be used anytime, anywhere as long as they have a smartphone. It also can benefit school teachers, dental nurses and even dental practitioners who wish to use this app as an aid in giving tooth brushing advices.

Keywords: Mobile App, toothbrushing, oral health, dental health education
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Suturing skills are important for every dentist to master in order to function competently. The maxillofacial region is a highly prominent area and is highly visible hence it demands a high level of skill in order to maintain facial aesthetics post trauma or surgery. The objective of this project is to create a cost-effective mobile suturing training kit which will allow students/dentists to practice suturing in the comfort of their homes or dormitories. This project aims to develop a comprehensive maxillofacial suturing training kit. The kit features a lifelike silicone face with typical maxillofacial soft tissue injuries. The kit also includes a needle holder, tooth forceps, scissors, non-resorbable and resorbable sutures, an instruction card and a training CD. The kit includes tutorials on different suturing methods, type of wounds and various surgical knots. The novelty of this product is that it is suitable to be used either by dental students who wish to learn basic suturing or even by dental specialists who want to practice and perfect their skills. A study done to study to analyse the effectiveness of the suturing kit in increasing undergraduates’ competence and confidence level in suturing showed a significant increase between pre and post intervention scores indicating that students were more competent in performing sutures after exposure to the kit. An increase in students’ confidence in suturing was also seen where the mean of 19.45 (pre intervention) increased to 25.74 (post intervention).

Keywords: maxillofacial, suturing, dental education, oral surgery
My Superhero Dentist Game

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Background: Dental phobia or anxiety is a prevalent problem among adults where in Malaysia a study shows that 94.1% out of 407 adults are affected. It is believed that the majority of this number experienced dental phobia from young and the fear was carried out into adulthood. Many interventions have been formulated in managing dental phobia and among them are Cognitive Behavioral Therapy (CBT), Relaxation Therapy, and Computer-Assisted Relaxation Learning. Problem statement: Children with high level of dental phobia will avoid seeing the dentist, only seeking treatment when symptomatic. Those within this group have a higher risk of gum disease and early tooth loss which could have been avoided. Objective: My Superhero Dentist game was designed and developed to explore the feasibility of using such digital means to ease and manage dental phobia/anxiety among children below 12 years old. Novelty: This game can easily be made available to dental clinics within Malaysia as a quick relaxation and diversion technique to comfort young patients waiting their turn to see the dentist. This game, unlike some therapy methods that need repeated sessions, can be used immediately and when needed. Benefits: While this game has not been tested extensively, it is assumed that children suffering from dental phobia will be able to manage their fear prior to seeing the dentist. Overcoming fear is by facing it and My Superhero Dentist will hopefully lessen their anxiety and make their dentist appointment a more pleasurable one and providing them a peace of mind when facing the appointments to come.

Keywords: dental game, dental phobia, digital game, phobia therapy
C-Shape Floss

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Oral health is very important as it connected to general and social well-being. One of the ways to maintain oral health is by flossing. Some people are not familiar to use floss that they prefer to use floss with handle. However, floss with handle that available in the market is straight and cannot clean as effective as the floss that tied to the fingers like using ‘spool technique’. The objective of this invention is to provide c-shape floss with handle that make the interdental area cleaning more effective. The IP has been submitted for this invention. This invention will benefit the public especially those who has problem with manual dexterity, so that they can do interdental cleaning much easier and more effective cleaning compared to the conventional floss with handle that available in the market.

Keywords: floss, c-shape, interdental cleaning, floss with handle

**Keywords:** rokok, risiko kesihatan, kesihatan oral
ABSTRACT

Fun with Oral Sciences Kit

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Society has acknowledged the importance of young children’s learning. Parallel to this growth has been the increase in knowledge generating activities. It is important to instil an attitude of inquiry from an early age. Preschool children especially have a limit ability to take care of their teeth and are at high risk for dental caries. Various factors have been identified to affect children’s teeth decay including poor oral hygiene and nutritional status among the children as well as the level of oral health-related knowledge, habits, attitude and self-efficacy among the schoolteachers and parents. Lacking oral sciences retooling for STEM education is the most important reason of developing this kit. Objective: The main objective is to develop a STEM-educational kit that contained oral hygiene postcards and a kit of do it yourself (DIY) toothpaste with three different type of flavours. Children are able to use this kit by following the instruction sheet given to produce three different flavours of toothpaste. Methods: The plain non-flavour natural toothpaste was purchased from jack and jill company. Gently, the toothpaste was added into the provided container. The food flavour was added according to the instructional sheet and packed in the provided container. The ready to use toothpaste can be explored immediately. Results: Children experienced different flavours of toothpastes according to their creativity. To improve the oral health conditions, a separate card describing the steps of brushing teeth was inserted into the kit. Conclusions: Science education plays an important role in developing creativity, critical thinking, and innovation to the future generation. Through collaborative and innovative play, children engage in diploid for analysis, reflection and critical thinking. This kit is able to help the children to understand the physiology behind of taste buds which is complex in nature. More importantly, it creates fun activity in brushing their teeth and eventually promote oral hygiene in children.

Keywords: Oral Sciences Kit, stem education, early learning.