Can we learn, teach and practise dentistry anywhere, anytime?

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IN BRIEF

- Draws attention to the different types of applications available for students, practitioners, tutors and patients.
- Helps students, practitioners and tutors realise that evidence-based applications are more reliable than applications that are not reviewed.

Dentistry-related applications for mobile phones are becoming a popular way of accessing information for students, practitioners and patients. The aim of this article is to review the use of mobile technology, such as 'apps', within dentistry. Over time, there has been a change from desktop learning (D-learning) to mobile learning (M-learning) and this has only been possible with the aid of electronic media and the growth of the Internet. In spite of the increase in mobile applications, there is a need for any information to have a strong underlying evidence base. Several good examples of dental applications which take full advantage of this electronic medium are available. However, developers of mobile applications should provide good quality, peer-reviewed evidence to validate their material.

INTRODUCTION

The mobile generation has swept everything before it. Once we were linked to our desktops; now we enjoy mobility with our laptops but this is only short-lived as mobile devices are becoming smaller, versatile and more powerful. The latest technologies that will revolutionise our workplace sound like they have come from science fiction novels. Concepts such as 3D printing, cloud computing, and the 'Internet of Things' are now becoming a reality, but what do they mean? What does the future hold for dentistry, our students and our patients? Our lifestyle is changing as mobile technology blurs the line between work and leisure. We are constantly 'in touch' and when social media is added to the equation then it becomes very difficult to distance oneself from the outside world. In dentistry our own practice and education is heavily reliant on such technology. We are able to access the latest updates and our learning needs are delivered to our Internet enabled devices when we want them.

Information technology (IT) in dentistry has received much attention over the years. One of the first articles was by Griggs and Stephens¹ and reviewed the impact of computers in dental education. In 2003, Walmsley *et al.*² showed how the Internet was changing teaching in a dental school and this was followed by a review of all contemporary dental related IT by Reynolds and others.³⁻⁵ It was concluded after much review that the future uptake of IT in dentistry will be facilitated by both the hardware and software, as both are equally important for the user.⁶

What these papers show is that the change in technology has rapidly affected our access to information. However, has the dental workplace really changed radically over this time period? How have sophisticated smart phones and mobile technology influenced our approach to learning and teaching in dentistry? Has it changed our approach to patient care?

The aim of this article is to provide a review of mobile apps in dentistry that provide examples of best practice in this rapidly changing field.

between 1945 and 1962. Are there tensions between the two generations? The potential clash occurs when department heads and senior personnel in healthcare are baby boomers and the juniors are generation X.⁷ When this was recognised generation X were recruited to more leadership roles to bring some freshness within institutes. Generation X will be industrious only if a favourable life work balance is in place but baby boomers are loyal to their host institution. Generation X will question authority while baby boomers respect authority. In contrast the newer generation Y, the so called millennium generation, are the people of today and want something in return for what they give. Training is valued and they are much more practical and hands on. They have a mentality to challenge things and want proof for everything presented.⁸ Technology has grown up with the millennium generation and it is an everyday part of life whereas previous generations would need special training to keep up.⁹ As technology demands adaptation and change all the time, out of all generations, our current students are ready to drop their current possessions for something that is better; they are more adaptive to change.⁷

Technology – D to E to M

Desktop computers are large and bulky machines but are still placed comfortably on top of desks, which suits previous

BACKGROUND

Societal changes

Generation X describes the cohort of individuals born between 1963 and 1981, and baby boomers are the body of people born

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generations.¹ Early on teachers were seen as the key medium for education. IT was only used to assist teachers in obtaining different methods of delivering course information. In dental education while desktop learning (D-learning) was well used, students were not fussy and did not question new techniques as they were not demanding. Similar to their teachers they were slow to embrace the new technology as more traditional methods of learning were still available. As new methods of delivering materials emerged, students were happy to try out new ways of learning.¹ These included electronic books¹⁰ and image libraries with explanatory notes and hypertext.¹¹ The mobility factor was just starting and electronic learning has become more embedded in the planning of dental education.

Today, learners are hungry for new themes and ideas. When it comes to devices and gadgets, the trendier, the better.¹² The traditional lecture is being challenged as not only can it be recorded and reviewed many times later, but students and teachers may discuss the contents away from the lecture hall. Students quickly search the Internet for information and therefore educational material should be designed to accommodate such styles of access. The aim is to direct the learner to educational material in a structured manner.¹³ In spite of the ease of search engines which allow people to find information, it is the quality that is the overriding factor and which will lead to the best treatments for patients.

The leap from D-learning to E-learning (electronic learning) could not be possible without the use of the Internet. Students can access the course material and other information at any time and away from the place of study.² Previously the validity and quality of the information provided from the Internet was questioned.^{14,15} As there was no guidance from tutors, the dangers were that students might make their own judgements and interpretations of the information presented which may not always be correct.¹⁶

Access to information continues and mobile technology offers advantages over traditional methods of educational delivery as it provides information at every different stage of a student's studies via applications (apps) and mobile friendly websites. Do we know how effective such delivery methods are and do they lead to changes

in how well students learn? While technology changes, making our professional life more exciting, there is still the need for high quality evidence-based material to ensure that we teach and practise our dentistry to the highest standards. Quality peer reviewed material should always underpin the technology to ensure we deliver the highest standard of teaching possible.

WHAT IS AVAILABLE AND WHAT IS MISSING?

The smartphones of today are powerful computers with large memory, good screen displays and the availability of apps.¹⁷ Such diversity gives the user a greater range of devices to choose from than before. This is appreciated in the training of healthcare professionals and organisations are using such technology to improve the care of patients while at the same time saving money. The use of 'iDoc' by the Welsh Deanery is one such example where smart phones are used as a cost effective way of distributing information.¹⁸ There is an app for just about everything today and students can download them easily for different educational subjects.¹⁸ There are more than 7,000 healthcare apps documented¹⁹ with the ability to support multimedia software applications which can be used to help with giving healthcare advice.²⁰ In February 2010, the Apple app store had 4,000 apps available to download and mobile health was one of the top ten 2012 apps.²¹ This has increased to 7,136 at the Apple store, Google Android with 1,296 followed by Blackberry with 338.¹⁷ Within dental education, there are apps available for practitioners/tutors, students and patients but it is often difficult to determine whether these apps are peer reviewed and how the quality has been assessed. Compared to dentistry, medicine appears to be more advanced with several applications developed which have been based on research carried out before the development of the app.²²⁻²⁵ By the year 2015, it is predicted by Research2Guidance that 500 million people using smart phones will be accessing one that is healthcare related.²⁶ The NHS Commissioning Board launched an NHS app library in March 2013. This app library employs a peer review process and those apps that pass the process are recommended for patient use.²⁷

APPLICATIONS FOR STUDENTS

If you wish to know what interests dental

students then look no further than the 'Teeth Geek'²⁸ website, which was built by a dental student and promotes the best apps out there for students. One of the recommendations is the 'Tooth 3D'²⁹ app which is available in different languages and also includes an encyclopaedia. However, while this app is attractive there is no immediate evidence base listed in the application details. This is a recurrent theme for many apps used in the health/dental speciality. Although there is good information available through apps, evidence of peer review, research undertaken or articles referenced which would validate the application is often not present. Certain apps such as 'Common dental drugs'³⁰ are available on the leading smart phone application websites. However, this application is a part of the health science bookshop, and was created as the electronic version of the *Handbook of commonly used drugs in dentistry*.³¹ The application allows students to access up to 12 fields of information on each drug. While this is more reliable, the price tag on this application is more expensive than those applications which are not part of a book shop or well acknowledged website. Does this mean that to gain valid information, there is a price to pay? There are other examples such as 'Endolit'³² which allows users to download electronic versions of their booklets. Although the articles cannot be forwarded or downloaded, they are present on the Endolit application where there is a mixture of paid and free articles.

The popular journal search engines from 'Google' and 'PubMed' have become more user friendly. The 'Google Scholar' app is available on Android smart phones as 'Scholar Droid'³³ allowing users to browse through the application for journals and also give the option to download as a PDF file. There is, however, no option to bookmark articles or send them as emails. Likewise, the application for 'PubMed' has been rephrased as 'PubMed on Tap'³⁴ allowing the user to import reference information and gain access to full PDF files if permitted. The PDF format is not ideal for small mobile screens and student/users would probably prefer material in a more user friendly manner. These apps are only just being advertised and not only is there a time lag for user uptake of these latest developments in technology but they become dated quickly. Institutions may be required to be more proactive in guiding

students to the correct sources for information access. More importantly, dental school departments and providers of continuing professional education for dentists need to focus on evidence-based applications which will equip students and dental professionals with the knowledge they need to become successful practitioners.

APPLICATIONS FOR PRACTITIONERS/TUTORS

Some companies have adapted their material successfully for use on the mobile platform; 'C and M dental'³⁵ is an application which uses animations to illustrate specialist dental precision attachments. Although working in the highly specialised area of precision attachments, it is an excellent example of a well-designed app built in collaboration with the University of Bern in Switzerland; the application shows not only animations but also clinical videos of several procedures. While there are few well executed apps present, it is likely this will not last for long and it is expected that there will be an increase of mobile software in the coming year. The Food and Drug Administration regulated the use of apps that allow practitioners to look at images on their mobile phones and devices that will give them a base to diagnose the patient without having to return to the office for a simple diagnostic.³⁶ Such apps could be applied to dentistry. Overall there is a need for research in how students and practitioners/tutors are using their smart phones and how much of an effect smart phone apps and websites are having on their dental studies and on their practice.

APPLICATIONS FOR PATIENTS

Patient advice is available through a range of software applications (apps), ranging from instructions on how to brush your teeth such as 'Brush DJ',³⁷ to what to do if you have toothache such as 'Dentify'.³⁸ Dentify is an application that assists patients in pain and has a strong evidence base related to its use. Dentify and Brush DJ are both listed on the NHS app library and are recognised as 'safe' and 'trusted' apps patients and practitioners can use.²⁷ Other examples of apps include one that enables patients to face their fears and overcome any issues they have related to dental anxieties. 'Dental fear Central'³⁹ is a dental support forum for patients with dental phobia. It involves help from dentists

and allows personal messages and posts to be read. It complements the 'Dental Fear Central'⁴⁰ website and is one of the first applications in this area. The American Dental Association has launched a 'symptom checker app' which allows patients to check their symptoms such as pain, discomfort and other symptoms so that they may be able to get a diagnosis. The app encourages patients to visit the dentist if needed.⁴¹

RISKS RELATED TO APPS

In a rapidly growing world of technology there will also be apps released that are not peer reviewed and may mislead the public. This in turn may have medico-legal consequences. The introduction of the NHS peer-reviewed library is a good example for protecting patients.²⁷ It is suggested that a similar peer review quality check is undertaken for similar apps in dentistry.

SUMMARY

Dentistry is being reshaped by the constant updating of technology and this includes the use of mobile phone apps. Any information that is made available for students, patients and practitioners via this medium should be evidence-based and should have undergone a peer review process.

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