Using technology to train and educate surgeons of the future

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We live in an age of rapidly advancing computer and information technology, alongside technological advancements in medical treatments. These are fully utilised in direct patient care, but lagging behind in the education of our future surgeons. Most surgeons in training still mainly learn from books and paper journals and surgical skills are taught mostly on living patients. I have been working, along with many others, on encouraging and developing online training tools, e-books and simulators. In this article I will review my developments and projects thus far.

Online Orthopaedic Education

Information is the knowledge derived from study, experience, or instruction. Education is the knowledge or skill obtained or developed by a learning process.

The search for information on the internet and collating of this information becomes Education, thus the Internet is a massive provider of Education, through numerous methods – direct or indirectly. Orthopaedic surgery has been a part of this information expansion.

Although almost every trainee can access the internet, even in developing countries, access to the latest books are limited. Many surgeons currently use the internet as a source of reference. It is easier and faster to update information than in new editions of books. One would naturally assume that there would be numerous high quality online resources to study from. For Orthopaedics there has only been two large online 'textbooks' – Wheeless and Orthoteers.



Orthoteers.com Website

Orthoteers was established out of personal necessity. As an orthopaedic trainee in 1999 I was studying for my final FRCS(Tr&Orth) exams with two colleagues. As we summarised and collated information for our exams, I digitised it all and set up a website for the three of us to access and review our study notes online. This website, Orthoteers, became extremely popular and was being visited by over 1,000 people per day by 2002. It became very expensive to maintain myself and we sought sponsorship. Unfortunately we could not find sufficient funding to maintain or develop the site and had to move to a subscription system. The site is still available free in developing nations and via charitable organisations. Orthoteers has become a popular reference and learning source for surgeons, with learning portfolios, image and video galleries and mobile versions. In the future we hope a national Orthopaedic Association will take over the running and further development of Orthoteers.

Another area of online education I have explored is providing easy access to surgical operative manuals and out-of-print classic books. Bartleby.com provides this service for non-medical books.

As a specialist shoulder surgeon, I found classic out-ofprint books still beneficial to me and my trainees. Putting these books online provides a lasting resource for classic reference of seminal books on shoulder surgery. These are provided in the Professional Education Section of www.shoulderdoc.co.uk.

New internet tools offer more creative and interactive ways of providing educational content. Video streaming is becoming commonplace and interactivity through numerous methods of communication available. These technologies are being implemented by social networking sites, but we are also incorporating them in our postgraduate Orthopaedic degree courses at Salford University. This makes our courses accessible to students geographically further afield than ever before. Students can interact with tutors, watch videos and perform interactive assessments online. They can collate learning references and keep an online learning archive for the future, comprising an array of multimedia content. Many other universities are also utilising online learning technologies to advance education.

Journal publishers are already offering their content online and expanding on the material with additional interactive material. They are now publishing online before the paper versions are released and offering online journals alone. It is just a matter of time before books routinely do the same. With Google stepping into this arena in 2009, it may happen quickly.

Surgical Simulation

Computer simulators are used in numerous industries. A pilot will not be allowed to transport a single passenger until numerous hours on flight simulators are completed. Safety features in vehicles are tested on simulations before implementation.

However, the majority of surgical skills are learnt on live patients. With the expansion of arthroscopic (keyhole) surgery, the surgical skills required are more advanced and dependent on technology than traditional open surgical techniques. Many simulators for surgery are available and in development. The computer processing power is now affordable and accessible to make these useable and realistic.

We have been working with GMV technologies (the same company that operates the Galileo space probe) to validate and develop a simulator for shoulder and knee arthroscopic surgery. Not only can surgeons develop their skills and practice common procedure, they can develop a training profile with scores generated on their technique and skill. Thus far, Manchester is the only centre to have the latest version of the simulator. Psychomotor skills training and assessment can be assessed and practiced remotely. We have developed an online arthroscopic psychomotor skills training tool, which is available at www.shoulderdoc.co.uk. Validation studies have shown this to be a useful competency screening tool and beneficial for enhancing the navigation skills required for complex arthroscopic surgery. Scores can be centrally collected and assessed by the trainer, as with the simulator.



Online arthroscopic surgical psychomotor skills test

The American Academy of Orthopaedic Surgeons (AAOS) has committed to making it a prerequisite for surgical trainees to train on simulators prior to learning on patients. In the UK annual clinical skills competency assessments are being introduced. I anticipate simulators and online skills assessment tools, as I have developed, maybe part of this process and improve the safety of patient care in the future.



Training on arthroscopic shoulder simulator



For further information, please visit:

www.shoulderdoc.co.uk www.orthoteers.com