SHORT REPORT

Online educational tools developed by *Heart* improve the knowledge and skills of hospital doctors in cardiology

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We conducted this study to find out if online learning packages in cardiology enabled users to increase their knowledge and skills. We also looked at how acceptable users found these packages. The journal *Heart* in association with BMJ Learning produced a series of modules on common cardiology problems. The modules involved a pre-test, a number of interactive cases and a post-test. A total of 1786 users completed these modules. Doing the modules enabled users to improve their score from the pre-test to the post-test by a significant amount ($p < 0.001$). Feedback to the modules was very positive.

Heart disease is the most common cause of death in the Western world.¹ It is vital that junior doctors get a good grounding in cardiology and that seniors stay up to date with changes in this rapidly changing field. Despite the need to learn about cardiology, junior doctors in the UK face reduced working hours and seniors sometimes struggle to balance their service commitments and their educational needs.² So despite the need to learn about cardiology, there is less time to do it in.

Online learning can help doctors obtain new knowledge and skills. It offers advantages over face to face learning: it can be done at the learner's pace and in circumstances that suit them. It can also be scaled up more easily than traditional learning—for fixed costs, unlimited numbers can use the content. It also enables use of new technologies such as multimedia learning. This is particularly useful in cardiology where important diagnostic tests such as angiograms are pictorial.

Although this means of learning seems attractive, there is limited evidence on the effectiveness of online learning. Friedl *et al* has shown that multimedia learning “can adapt to the individual needs of learners and improve procedural knowledge required for open heart surgery”.³ Gold *et al* showed that online learning modules were used and appreciated by residents in thoracic surgery.⁴ Vollmar *et al* showed that online continuing medical education can support learning and may establish a stimulus for translation of medical knowledge into daily clinical practice.⁵

Taking this in account, the journal *Heart* developed online modules in cardiology. We conducted this study to find out if these online learning modules enabled users to increase their knowledge and skills. We also looked at how acceptable users found these packages.

METHODS

In November 2003, the BMJ Group launched BMJ Learning (www.bmjlearning.com), an online learning resource for healthcare professionals.

BMJ Learning allows doctors to:

- Assess their learning needs
- Plan and record learning activities

- Use learning modules built by BMJ Learning and by other providers such as *Heart*.

Since 2005 BMJ Learning has hosted the online learning modules produced by *Heart*.

These modules consisted of:

- An initial test to assess users' current knowledge
- A series of comprehensive interactive case presentations about a topic
- A final test—this is a repeat of the pre-test to find out what users learnt from the module
- The modules covered the following topics: acute coronary syndromes, aortic stenosis, aortic dissection, pericarditis, infective endocarditis, peripartum cardiomyopathy, acute chest pain, acute aortic syndromes, aortic valve replacement, ventricular tachycardia, aortic stenosis, aortic dissection and patent foramen ovale.

Pre-test

Heart built online tools to assess doctors' baseline knowledge. The tool was in the form of “best of many” multiple choice questions.

Cases

Heart then built online tools to increase doctors' knowledge and skills on how best to care for these problems. The first page was an outline of why this topic is important and the learning outcomes from that module. Next the learners came to an introduction that explained what the module was about. The users then learnt about the topic in an interactive way. The text was supported with graphics and multimedia where appropriate. At the end the key points were reinforced. A list of references and further resources were included. Finally the users were encouraged to reflect on the learning experience by writing down their thoughts. Users could also print out a certificate of completion at the end.

RESULTS

A total of 1786 users completed the modules between 12 March 2006 and 30 November 2006. The mean pre-test and post-test scores are as shown in table 1. We used an SPSS statistical package to analyse the data. Wilcoxon's test revealed that users increased their score by a significant amount ($p < 0.001$).

Qualitative feedback on whether users found the tool useful

We received over 800 individual items of feedback. The feedback was positive. Many users commented that they valued being able to look at echocardiograms and angiograms online.

Examples of feedback are as follows:

“Excellent overview, I enjoyed learning with the complement of understanding where the evidence came from.”

Table 1 Mean pre-test and post-test scores

	Number of users	Mean pre-test score	Mean post-test score	Mean improvement in score	p Value
Acute coronary syndromes	224	51	71	+20	<0.001
Infective endocarditis	171	57	87	+30	<0.001
Peripartum cardiomyopathy	119	62	84	+22	<0.001
Acute chest pain	376	69	86	+17	<0.001
Acute aortic syndromes	92	54	80	+26	<0.001
Aortic valve replacement	125	55	87	+22	<0.001
Ventricular tachycardia	178	56	81	+25	<0.001
Aortic stenosis	195	70	89	+19	<0.001
Aortic dissection	164	61	87	+26	<0.001
Patent foramen ovale	142	59	84	+25	<0.001

"A lot of new information for me about coronary artery dissection in the peripartum period."

DISCUSSION

Cardiology is a quickly changing specialty. Recent advances have enabled many promising ways of managing patients such as new treatments and technologies. But these advances have been accompanied by other changes to healthcare systems, such as reduced training times and smaller budgets for educational meetings. To help solve these problems we need new ways of learning that are effective and time efficient.

Online learning has an important role to play; it enables large numbers of users to learn at a time and a place that suits them. Thousands of learners can access the material at no extra cost to the provider.

The results of this study show that these online learning modules are effective at helping doctors learn about common cardiology problems. The study shows notable improvements in knowledge and problem solving skills as a result of the educational intervention. However, we do not know whether users have actually put this new knowledge and skills into practice. Further studies are needed to find this out. Barnes concluded that the "killer application" for improving physician performance will involve integrating these types of applications with clinical information systems, which will allow physicians to move between practice and learning through a single interface.⁶ This should soon become a reality. The modules could help provide learning content from day one of medical school to the achievement of consultancy and thereafter.

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