E-learning modules in new and emerging infectious diseases improve the applied knowledge and problem-solving skills of healthcare professional learners

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INTRODUCTION

Infectious diseases are a common cause of morbidity and mortality throughout the world.[1] It is vital that doctors, nurses and other healthcare professionals learn the knowledge, skills and behaviours to better care for patients with infectious diseases. The competences that healthcare professionals must learn include those of diagnosis, management, reporting and prevention. Some infectious diseases are rare and so healthcare professionals have little opportunity to learn in the clinical environment by caring for affected patients. Although rare, some of these diseases are potentially catastrophic to global health.[2] So we need to develop new methods of education to help healthcare professionals learn how to better manage these diseases.

E-learning may be one method to provide education on infectious diseases. E-learning can help doctors and other healthcare professionals obtain new knowledge and skills.[3 4] It can also be continually updated with the latest practice-changing evidence—which is important in rapidly changing infectious diseases.[5] Such resources can offer other features that are attractive to learners from the health professions: they are time efficient and so short; they can be image rich which may be important in a specialty which often relies on clinical examination, radiological and microbiological skills; they can be case based—according to how patients typically present and they can be in an interactive and problem-solving format—to allow users to practise their problem-solving skills in a safe online environment where they can learn from their mistakes without causing harm.

BMJ Learning is the e-learning provider of the BMJ. We conducted an analysis of the infectious disease modules on BMJ Learning to find out if the e-learning modules enable users to improve their applied knowledge and problem-solving skills in this field.

METHODS

BMJ Learning modules consist of the following sections: an initial test to assess users' baseline applied knowledge and problem-solving skills (the pretest); a series of comprehensive interactive case presentations and a post-test—to find out what users learnt from the module.

We conducted a quantitative analysis of the following data on BMJ Learning modules that relate to infectious diseases: we analysed the number of modules completed as well as the pretest scores of learners, the post-test scores of learners and the change in score from pretest to post-test.

In addition, we conducted a qualitative analysis of the free text reflections from users on the modules. Healthcare professionals are encouraged to reflect on their learning when they have completed the modules and to add their reflections to a free text box at the end of the modules. All of the learners' reflections on the modules were captured by the programme's software. The reflections were analysed using thematic analysis.

RESULTS

Quantitative analysis

The total number of module completions as well as mean pretest scores, post-test scores and improvements in scores are shown in table 1. One thousand five hundred and twenty-three modules were completed. The mean pretest score was 47.8%, the mean post-test score was 82% and the mean increase in score was 34.2%.

Qualitative analysis

We conducted a qualitative analysis of the free text reflections from users on the modules. Six key themes emerged from this analysis.

Theme 1: putting learning into action

Many learners reflected on how they planned to put their learning into action after doing the modules. Learners planned to change and improve their practice related to the diagnosis, differential diagnosis or management of patients with infectious diseases. One learner reflected: 'Really useful module and will change my practice—from making the diagnosis in the first place, to choice of antibiotic/duration of treatment'.

Theme 2: satisfying learning needs

Many learners commented that the modules were helpful in satisfying their learning needs. Some of them had little previous knowledge about important areas and so were pleased that they were able to fulfil a learning need. One learner commented: 'I was not aware of how to manage this problem, very helpful module'. Another reflected that the content was a 'steep learning curve for me. The management algorithm with links was the jewel in the crown'.

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Table 1 Improvement following learning

	Number of completions	Pretest score (%)	Post-test score (%)	Improvement in score (%)
Anthrax	104	66.30	82.60	16.30
Bacterial food poisoning due to toxins	46	61.00	83.20	22.20
Botulism	72	57.50	83.70	26.20
Chlamydia infection	98	29.9	75.1	45.2
Coccidiomycosis	84	55.90	79.20	23.30
Common toxic plant ingestion	46	39.80	81.50	41.70
Coxiella burnetii infections (Q fever)	46	37.40	82.10	44.70
Crimean-Congo haemorrhagic fever	63	67.50	79.80	12.30
Ebola and Marburg virus infections	56	57.40	90.70	33.30
Equine encephalitis infections	52	52.70	82.30	29.50
Henipaviruses	22	62.40	81.30	18.90
Herpes B virus	31	39.40	83.10	43.80
HIV infection	36	35.2	80.2	45
Influenza: seasonal and avian cases	87	60.90	80.60	19.60
Lassa fever	49	55.50	86.40	30.90
Marine toxins	27	46.40	86.40	40.00
Measles	39	35.1	88.9	53.7
Melioidosis and glanders	30	36.20	79.70	43.50
Meningitis in adults	62	31.2	72.9	41.7
Mumps	49	28.1	77.8	49.7
Plague and other *Yersinia* infections	48	54.20	84.30	30.10
Poxvirus infections	22	65.00	86.50	21.50
Rickettsial diseases	45	51.10	82.60	31.50
Rift Valley fever	75	51.60	85.80	34.20
Sexually transmitted infections	31	34.7	79.3	44.6
Sore throat	50	24.1	70.7	46.6
Trichothecene mycotoxins	22	57.00	83.00	26.00
Tularaemia	131	45.30	84.80	39.60
Overall	1523	47.8	82	34.2

Theme 3: format of the learning modules

Many learners commented on the format of the modules. Clinical images were most appreciated by the learners. One learner reflected: 'Certainly an eye opening module. Liked…the pictures made it easier to retain knowledge acquired (sic)'.

Theme 4: learning is best when it is case based

Many of the reflections made note of the case-based nature of the learning materials. Learners appreciated being able to learn from relevant case scenarios that could occur in their everyday clinical practice. One learner reflected: 'Excellent cases, useful and relevant approaches for follow-up of patient'. Another considered that 'the comments with the cases scenario are very useful'.

Theme 5: assessment questions add value

Learners clearly thought that the assessment questions added value to the modules. Learners commented on the assessment questions at the start and the end of the modules. One learner commented: 'Very good module. Learnt a lot by doing the questions'.

Theme 6: more resources needed

Although the reflections were broadly positive about the modules and the learners' plans to improve their practice in light of them, many learners stated that they still had areas that they wanted to learn about and suggestions on how we could make the modules better. One learner reflected that 'more of a primary care focus would have been better'.

DISCUSSION

E-learning is an effective means of enabling healthcare professionals to learn about infectious diseases. Quantitative analysis shows that the modules on infectious diseases enable users to improve their applied knowledge and problem-solving skills. Qualitative analysis shows that learners are keen to satisfy their learning needs and to put their learning into action.

There are limitations to this analysis. The learners were not mandated to do the learning modules. They were self-selecting and so may not be representative of all learners. Also the learners' reflections about practice change were by their nature self-reported and so subjective.

Nonetheless, we feel that this evaluation does add an important piece to the evidence base about what works in the education of healthcare professionals in infectious diseases. We plan to conduct further analyses of the exact knowledge needs of users in infectious diseases and also further evaluations to look for evidence of quality improvement in institutions following provision of the education.

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Contributors KW conceived the idea and wrote the paper.

Competing interests KW works for BMJ Learning which produces a range of educational content in infectious and non-infectious diseases.

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Notes