Online E-Learning Course
An Innovative, New Training Tool for Reading Colon Capsule Endoscopy Videos

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" Colon capsule endoscopy with the PillCam Colon ® system is a relatively new, minimally invasive method for colorectal imaging. When reading the capsule video, identification of polyps and other significant lesions is dependent on the reader skills, and adequate reading training is necessary to ensure high quality reports. We have developed a structured e-learning training course for reading colon capsule endoscopy videos. The course focuses on improving skills for reading and analyzing colon capsule videos, and includes a blend of theoretical learning, reading practice with interactive feedback, and knowledge assessments. The course automatically optimizes reading practice according to individual skill level. The Japanese Association of Capsule Endoscopy (JACE) endorsed the e-learning course during early 2014. Twenty Japanese physicians completed a full online pilot course, of whom 67% indicated that the e-learning course was extremely helpful, and 33% indicated that it was very helpful in improving their reading skill. The new e-learning course appears to be a promising training tool which provides an efficient and flexible online learning method optimized according to the trainee skill level. The course is being used in Japan, and ongoing work is being carried out to expand its usage worldwide. A French version is currently being prepared with the intent to introduce it to France during 2015."

Colon capsule endoscopy with the PillCam Colon ® system is a relatively new, minimally invasive method for colorectal imaging. The system includes an ingestible capsule with two camera heads, sensors, a small data recorder, and a software package called Rapid ®. The data recorder is carried by the patient and receives and stores images from the capsule as it propagates through the colon. The recorded images are viewed as video on a workstation using the Rapid software, which also allows the creation of procedure reports.

When reading the capsule video, the identification of polyps and other significant lesions is dependent on the reader skills, and adequate reading training is necessary to ensure high quality reports.

Capsule endoscopy for small bowel visualization has been available for over 15 years, and courses including reading training have been offered worldwide. However, colon physiology presents new challenges to the colon video reader such as complex, non-insufflated anatomy, complex capsule transit patterns, and turbid or cloudy colon fluid. In addition, the colon capsule has two camera heads *versus* the single camera of the small bowel capsule, which increases reading complexity.

Therefore a new reading method is needed. Furthermore, a recent study in France [1] concluded that training and experience in small bowel capsule video reading is not sufficient for colon reading, and reading training specific to the colon capsule is needed to ensure the quality of the report

An e-learning course

We have developed an e-learning training course for reading colon capsule endoscopy videos. The course focuses on improving skills for reading and analyzing colon capsule videos, and includes a blend of theoretical learning, interactive reading practice with the Rapid ® software, and knowledge assessments. There are six steps in the course (*figure 1*).

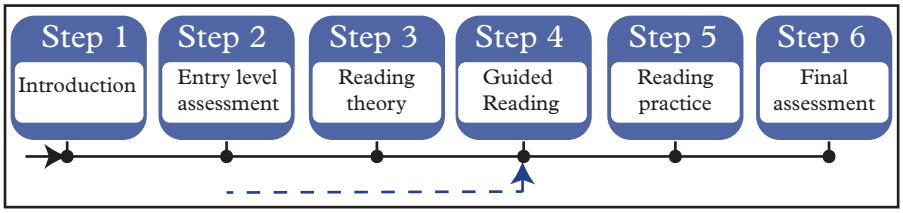

Figure 1. Six steps of the the e-learning course. The trainee progresses through the steps until completion of the training. The course supports both full on-line and blended learning; trainees that attended an instructor-led training in a class, can prove their knowledge in Step 2 (Entry Level Assessment) and skip Step 3 (Reading Theory), as marked with the blue arrow in the figure.

Step 1: Introduction

This step introduces the trainee to the course and reading challenges.

Step 2: Entry Level Assessment

This step allows experienced readers or trainees who attended an instructor-led training in a class, to test their knowledge and skip Step 3, reading Theory, if they obtain a score of 80% or higher.

Step 3: Reading Theory

This step includes five sessions that cover the recommended reading method. Some sessions include interactive practice with the Rapid software, in which the trainee can practice with real Rapid video and get feedback.

Step 4: Guided Reading

This step offers the trainee a chance to read and analyze a full-length video and eight short video segments using the Rapid software, emphasizing specific skills and professional issues, and providing the trainee with feedback.

Step 5: Reading Practice

In this step, the trainee practices full-length video reading with the Rapid software until becoming eligible to take the Final Assessment. When the trainee is ready to submit each report, Rapid reviews the report and displays current accuracy in a percentage range with no additional information. The trainee may continue reading the video to improve the report accuracy. After submitting the report, the trainee can no longer improve the score. Rapid evaluates the report, provides a detailed evaluation feedback, and grants a score based on report accuracy. The score takes into account successful reporting of polyps, including polyp size, shape and location, cleansing level, and false-positive reports. The greater the challenge, the higher the score. The number of videos read is automatically set according to the individual skill level. The score granted for each video is accumulated by Rapid, and after reaching a predefined target score or reaching a maximum number of videos read (n = 14), the trainee can proceed to the next step and perform the Final Assessment. Therefore, a highly skilled reader may need to read a relatively small number of videos prior to performing the Final Assessment.

Step 6: Final Assessment

This step includes reading two full-length videos and two short video segments with the Rapid software. The score granted for each video is accumulated but not shown, and a final assessment score in percentile units is provided upon completion of the course.

Development perspectives

The e-learning training course offers several major advantages:

- It supports full practice of theoretical learning with interactive feedback,
- It provides efficient and flexible on-line learning,
- The trainee is not confined to a fixed schedule,
- It automatically optimizes reading practice according to individual skill level,
- It supports both blended and full online learning,
- It allows cost savings *vs* an equivalent course with full practice.

Following the completion of development, the Japanese Association

of Capsule Endoscopy (JACE) reviewed and accepted the e-learning course during early 2014. Twenty Japanese physicians completed a full online pilot course. The majority of the physicians (78%) did not read any colon video prior to the course, 11% read 1-5 videos, and 11% read 6-15 videos. Two of the feedback questionnaire results are shown in *figure 2*.

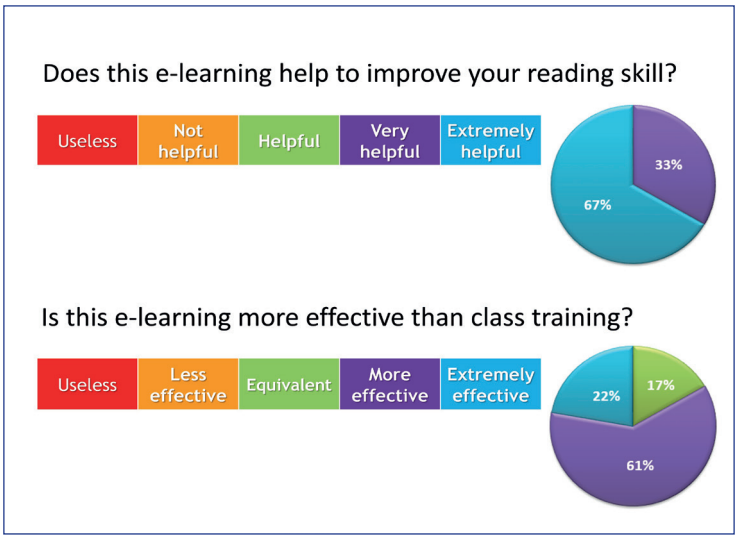

Figure 2. Two sets of questionnaire results obtained from 20 Japanese physicians who took the e-learning pilot course.

Sixty-seven percents of the trainees indicated that the e-learning course was extremely helpful, and 33% indicated that it was very helpful in improving their reading skill. When asked if the e-learning course is more effective than class training, 22% of the trainees indicated that the e-learning is very much more effective, 61% of the trainees indicated that the e-learning is more effective, and 17% indicated that it is equivalent.

A French version of the e-learning course is currently being prepared with the intent to evaluate and introduce it to France during 2015.

Conclusion

In summary, the new e-learning course for reading colon capsule endoscopy videos appears to be a promising training tool that provides an

efficient and flexible online learning method optimized according to the trainee skill level. The course is being used in Japan, and ongoing work is being carried out to expand its usage worldwide.

Conflict of interest

The authors are employees of Given Imaging, a Covidien Company.

Reference

1. Danset JB, Bejou B, Saurin JC, Ponchon T, Benamouzig R. Colon capsule endoscopy by experimented gastroenterologists practicing the small bowel capsule endoscopy requires a specific training. *Gastrointest Endosc* 2014 ; 79: Supplement, AS307. doi: 10.1016/j.gie.2014.02.263