Research Paper

Development of an E-learning System for the Endoscopic Diagnosis of Early Gastric Cancer: An International Multicenter Randomized Controlled Trial


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1. Introduction

Almost one million new cases of gastric cancer were estimated to have occurred throughout the world in 2012 (952,000 cases, 6.8% of total new cancer cases), making it the fifth most common malignancy after cancers of the lung, breast, colorectum and prostate (GLOBOCAN, 2012). Gastric cancer is the third leading cause of death from cancer among both sexes worldwide (723,000 deaths, 8.8% of total cancer deaths). Most patients with gastric cancer are diagnosed at an advanced stage, with an overall 5-year survival rate of approximately 28% (American Cancer Society. Cancer facts and figures, 2014). Early detection is the key to improving the survival of gastric cancer patients (Leung et al., 2008). Upper gastrointestinal endoscopy is a widely accepted procedure for early detection of gastric cancer. However, in many countries, endoscopists have limited opportunities to acquire the techniques, knowledge and experience which are imperative for the endoscopic detection of early gastric cancer (EGC) when only subtle mucosal morphology is apparent (Veitch et al., 2015). In contrast, endoscopists in Japan have more such opportunities thereby enabling them to detect subtle lesions that suggest EGC.

In order to overcome these problems, we have developed an Internet-based e-learning system which is in English, and which is available anywhere in the world, and at any time of the day, so that clinicians worldwide can learn how to detect EGC (Yao, 2013). Recently, advanced imaging endoscopy techniques have become a topic for discussion in many countries, endoscopists have limited opportunities to acquire the techniques, knowledge and experience which are imperative for the endoscopic detection of early gastric cancer (AGA), 2008). Upper gastrointestinal endoscopy is a widely accepted procedure for early detection of gastric cancer. However, in many countries, endoscopists have limited opportunities to acquire the techniques, knowledge and experience which are imperative for the endoscopic detection of early gastric cancer (Veitch et al., 2015). In contrast, endoscopists in Japan have more such opportunities thereby enabling them to detect subtle lesions that suggest EGC.

2. Materials and Methods

2.1. Study Design

Global e-Endo Study Team (GEST) was organized to develop an e-learning system to improve the detection rate of EGC among endoscopists worldwide. This study was conducted as an international, randomized, controlled trial to evaluate the effectiveness of the e-learning system. The study was conducted in line with the Consolidated Standards of Reporting Trials (CONSORT) statement (Schulz et al., 2010) and the Declaration of Helsinki (World Medical Association Declaration of Helsinki, 2013).

The study protocol was approved by the institutional review board of Fukuoka University Chikushi Hospital, Japan (R12-060, dated February 6, 2013), and was registered as Clinical Trial No. UMIN R00012039. Written informed consent was obtained from all participating endoscopists.

2.2. Participants

We recruited endoscopists from 35 countries around the world between March 2013 and November 2013. Inclusion criteria were 1) ability of the web browser on a participant’s computer to display and to operate sample contents of the e-test and e-learning system; 2) sufficient English skills to understand the materials of the e-test and e-learning system; 3) provision of a fully completed pre-study questionnaire sheet; and 4) provision of a signed consent form for participation in this study. Medical practitioners who did not complete the pre-test or whose pre-test score was 80% or more were excluded from the study because the e-learning system was aimed at providing training for those who had not previously received adequate training in the endoscopic diagnosis of EGC. A specific username and password were assigned to each participant to enable e-test results to be collected via the Internet and to control access to the e-learning system during the e-learning period.

3. Interventions

3.1. Pre-test Evaluation

Participating endoscopists undertook a pre-test via the Internet between February 1st 2014 and February 28th 2014. The participants viewed 40 sets of endoscopic images on their web browser. Each set of endoscopic images contained 18 to 24 images that had been systematically taken during screening endoscopy to record the whole gastric mucosa in a single patient, according to systematic screening protocol for the stomach (Veitch et al., 2015; Yao, 2013). All endoscopy images were acquired using a high-definition electronic endoscopy system (EVIS LUCERA Spectrum System, Olympus Co. Ltd., Tokyo, Japan) and high-definition upper gastrointestinal endoscopes (GF-H260; GIF-H290, Olympus Co. Ltd.). The 40 patients consisted of 20 patients with EGC and 20 patients with non-cancerous findings. Each lesion was histopathologically confirmed as either cancer or non-cancer. The histopathologic diagnosis was based on the revised Vienna classification (Schiemper et al., 2000): C1 (negative for neoplasia), C2 (indeterminate for neoplasia) and C3 (mucosal low-grade neoplasia) were diagnosed as...