The usefulness of artificial intelligence in gastric neoplasms

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Answers to reviewers:

Reviewer #1.

First, System. As there are so many AI systems mentioned, how to compare and interpret results from different systems? What is the strength of each system?

Response) Thank you for your comment.
ResNet, GooLeNet, VGG are all different types of algorithms of AI developed recently by different sources. Algorithms of AI have been modified and developed in order to minimize classification errors with improved outcome. Each algorithm has different architecture, different number of layers and parameters and all algorithms have received first prize in ImageNet Large Scale Visual Recognition Challenge (ILSVRC) at different years. VGGNet consists of 16 convolutional layers, and its strength is that it can be trained on 4 graphic processing units in 3 weeks. ResNet incorporates "skin connections" that enables usage of larger number of layers, but with less complexity and low error rate. GooLeNet uses ReLU activation in all layers and drop out regularization in the fully-connected layer, has large number of layers but lower number of parameters.
It is difficult to compare results from these algorithms as there aren't enough reports on comparison between algorithms in esophagogastroduodenoscopy. Although Lee et al reported that ResNet showed highest performance in differentiating cancer, ulcer, and normal mucosa, it lacked external validation (PMID 30719560).

Second, Prospect. Since the application of AI in the field of gastric neoplasms is promising, how has it practiced in clinical setting so far? What is the obstacle that may occur if it is about to become widely available?

Response) Thank you for your comment.
Promising results from AI based studies have raised the question: "can or will AI replace doctors?" Although some experts predict that robot will replace doctors in certain field of medicine in the near future, there are still many concerns regarding safety, accuracy, legal responsibility, government approval and cost. Although studies have shown that accuracy of detecting gastric cancer by AI is comparable to some doctors, experienced doctors with expertise have shown better performance than AI. This means that there is limitation to relying solely on AI alone. However, beneficial factors from application of AI, such as improved efficacy and time spent on repetitive task, must be acknowledged as well. Accordingly, the most applicable field of AI would be medical image data processing that could aid in improved diagnostic performance of trainees and non-expert doctors. These comments were added in the manuscript.

 EndoBRAIN-EYE (Cybernet Systems, Tokyo, Japan) has already received approval from pharmaceutical and medical device act, while other companies have already developed different AI systems. As endoscopy is a real-time process, future studies on real-time application of AI can be expected, and open platform type software can be adapted to endoscopy for improved detection of gastric neoplasms.

Third, Hard-to-Find GCs. In Hirasawa's study, the CNN correctly identified 71 of 77 gastric cancer lesions with an overall sensitivity of 92.2% and 70 of 71 lesions (98.6%) with a diameter of ≥ 6 mm, but only 1 of 6 (16.7%) for minute GCs. How is the detection of hard-to-find GCs, such as minute GCs, by various AI methods?

Response) Thank you for your comment.
As you have identified, Hirasawa et al. was the only group who analyzed sensitivity of neoplasm detection in various sizes. Although other studies have mentioned mean or median size of neoplasms (mean size of 14mm in study by Horiuchi et al., and median size of 10mm in study by Ikenoyama et al.), comparison between different size have not been done in other studies. However, AI systems for colonoscopy have been developed with improved detection of diminutive polyps that are less than 5mm in diameter (PMID 30623149, 26264431, 29066576, 29042219) so it is hopeful that future CNN models can help improve detection of such minute GCs. The part you pointed out about minute cancers detection was added to the manuscript.

Additionally, Language Skills. Language should be polished. For example, some descriptive words in figures are quite confusing. It will be better illustrated if

corrections are made. For the reasons above, I suggest a minor revision in the present form.

Response) Thank you for your comment. We have modified descriptions in figures, and have reviewed the manuscript with some minor adjustments.

Reviewer #2.

Thank you for your comment.