PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (**http://bmjopen.bmj.com/site/about/resources/checklist.pdf**) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Educational Virtual Reality Videos in Improving Bowel Preparation Quality and Satisfaction of Outpatients Undergoing Colonoscopy: Protocol of A Randomized Controlled Trial
AUTHORS	Zhao, Yi; Xie, Feng; Bai, Xiaoyin; Yang, Aiming; Wu, Dong

VERSION 1 – REVIEW

REVIEWER	James M. Richter, MD Massachusetts General Hospital Boston, MA 02114 USA
REVIEW RETURNED	15-Mar-2019

GENERAL COMMENTS	More detail would be valuable about the details of the virtual reality experience, what specific technology will be used and how it is different from a conventional video. Are there language and dialect issues that need to be addressed or controlled for? Do all patients undergoing colonoscopy have a pre procedure visit? Some centers offer open access for screening and less acutely ill patients which may make those who attend clinic less representative of the whole population.

REVIEWER	Ajish Pillai Drexel University College of Medicine, Philadelphia, PA, USA
REVIEW RETURNED	01-Apr-2019

GENERAL COMMENTS	1) I am surprised the split bowel preparation is 2L liters the day before the colonoscopy and 1 Liter on the day of the procedure. Why not use 2 liters night before and 2 liters on the day of the procedure? 2) How are the pre-procedural anxiety reduction measured? Will there be a standardized anxiety scale? 3) This is a intriguing study because it utilizes VR, looking forward to see the results of VR if can augment compliance, optimal bowel preparation and reduce pre-procedural anxiety level.

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
Reviewer Name: James M. Richter, MD
Institution and Country: Massachusetts General Hospital
Boston, MA 02114
USA
Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below

1) More detail would be valuable about the details of the virtual reality experience, what specific technology will be used and how it is different from a conventional video.

Answer: Thanks for the comment. We have supplemented this part with more details in Methods (The intervention group: conventional methods plus VR videos) and Discussions section.

Methods:
The intervention group: conventional methods plus VR videos
In addition to the routine patient education methods mentioned above, patients in the intervention group will watch a VR video using a head-mounted 3D display (Figure 2) for about 6 minutes. Patients will be placed in the simulated settings of an operating room in the VR video. Four parts will be offered, including instructions on bowel preparation step by step, points for attention before and after the procedure, brief introductions to the specific procedures of colonoscopy and a to-do list after a therapeutic procedure (e.g., polypectomy). The device can track head movements and patients can familiarize themselves with the operating room and select the part they want to learn with head motion. Patients can only exit when they have finished all these four parts.

Discussions:
The trial is aimed to explore whether VR videos can improve the bowel preparation quality through increasing patient adherence and experience, reduce pre-procedure anxiety, compared with the conventional patient education methods. To date, there have been several studies demonstrating that extensive patient education methods are effective in enhancing the bowel preparation quality. However, there is a lack of evidence on the effect of VR videos, a novel technology which can arouse patients' interests and motivation. Compared with conventional video, VR videos can provide patients with immersive experiences simulating the process of bowel preparation and colonoscopy. The sense of immersion provided by VR videos is believed to be able to reduce the attention distracted by surroundings, which is proved by the fact that VR is used in chronic pain control. Thus, it is likely that VR videos can make patients more concentrated in the education and enhance the effect of patient education before colonoscopy, leading to better results of the procedure.

2) Are there language and dialect issues that need to be addressed or controlled for?

Answer: Thanks for the comment. Mandarin and simplified Chinese are used in the video, which are also widely used by our patients. In clinical practice, we didn't find that language and dialect could be a serious issue since the vast majority of our patients have no difficulty in using mandarin in patient-physician communication. In addition, education level will be included and controlled for in the baseline characteristics, to ensure that there will be no statistically significant differences between control and intervention group, which is believed to be an influence factor in bowel preparation.

3) Do all patients undergoing colonoscopy have a pre procedure visit? Some centers offer open access for screening and less acutely ill patients which may make those who attend clinic less representative of the whole population.

Answer: Thanks for the comment. This is indeed an important issue. All patients in our study will have a pre-procedure visit. Only outpatients intending to receive colonoscopic examination for screening or diagnostic purpose are included in the study. Acutely ill patients who are hospitalized or indicated for emergency colonoscopy will be excluded. By applying such a criteria, we aim to reduce bias of patient selection in control and intervention group. Needless to say that it will restrict generalization of our study to inpatients and emergency situations.

Reviewer: 2
Reviewer Name: Ajish Pillai
Institution and Country: Drexel University College of Medicine, Philadelphia, PA, USA
Please state any competing interests or state 'None declared': None declared.

Please leave your comments for the authors below

1) I am surprised the split bowel preparation is 2L liters the day before the colonoscopy and 1 Liter on the day of the procedure. Why not use 2 liters night before and 2 liters on the day of the procedure?

Answer: Thanks for the comment. 4-liter split-dose PEG is reported to be superior to other regimes [1] and is recommended by ESGE [2] for bowel preparation in the western population. However, it is still questionable whether such a large volume can be well tolerated, especially in Chinese population, with a smaller body size compared with Caucasians. It is also reported that BMI was an independent factor associated with bowel preparation efficacy [3]. Thus, 3-liter split-dose PEG is widely adopted in China and is also recommended by Chinese guidelines [4].

2) How are the pre-procedural anxiety reduction measured? Will there be a standardized anxiety scale?

Answer: Thanks for the comment. Self-rated sleep quality before colonoscopy will be used to measure anxiety level, as higher levels of anxiety is reported to be associated with poor sleep quality, subjectively reported or objectively measured [5,6]. We do agree that a standardized anxiety scale is a better method in measuring anxiety level, but it is usually time-consuming. Due to the large number of patients and limited time for each patient in the clinic, a simpler way like self-rated sleep quality may be more practical.

3) This is an intriguing study because it utilizes VR, looking forward to see the results of VR if can augment compliance, optimal bowel preparation and reduce pre-procedural anxiety level.

Answer: Thanks for the comment. We are glad the people are interested in our research and we will publish the results as soon as we complete enrollment and analysis.

Reference

[1] Enestvedt B K, Tofani C, Laine L, et al. 4-Liter Split-Dose Polyethylene Glycol Is Superior to Other Bowel Preparations, Based on Systematic Review and Meta-analysis[J]. Clinical Gastroenterology and Hepatology, 2012, 10(11): 1225-1231.
[2] Hassan C, Bretthauer M, Kaminski M F, et al. Bowel preparation for colonoscopy: European Society of Gastrointestinal Endoscopy (ESGE) Guideline[J]. Endoscopy, 2013, 45(2): 142-150.
[3] Fayad N F, Kahi C J, Jawad K H, et al. Association Between Body-Mass Index and Quality of Split Bowel Preparation[J]. Clinical Gastroenterology and Hepatology, 2013, 11(11): 1478-1485.

[4] Chinese Society of Digestive Endoscopy. Bowel preparation for endoscopy: Chinese Society of Digestive Endoscopy (CSDE) Guidelines (in Chinese)[J]. Chin J Dig, 2013,33(09):593-595. DOI: 10.3760/cma.j.issn.0254-1432.2013.09.003
[5] Norbury R, Evans S. Time to think: Subjective sleep quality, trait anxiety and university start time[J]. Psychiatry Research-neuroimaging, 2019: 214-219.
[6] Spira A P, Stone K L, Beaudreau S A, et al. Anxiety Symptoms and Objectively Measured Sleep Quality in Older Women[J]. American Journal of Geriatric Psychiatry, 2009, 17(2): 136-143.

VERSION 2 – REVIEW

REVIEWER	Ajish Pillai, MD Drexel University College of Medicine, PA USA
REVIEW RETURNED	04-Jul-2019

GENERAL COMMENTS	The reviewer completed the checklist but made no further comments.