Thieme

Can an educational video improve the adequacy of bowel preparation for patients undergoing their first colonoscopy? Results of the EBOPS RCT

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received 15.4.2023
accepted after revision 1.2.2024

Bibliography

Endosc Int Open 2024; 12: E402–E412
DOI 10.1055/a-2262-4023
ISSN 2364-3722

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Supplementary Material is available at https://doi.org/10.1055/a-2262-4023

ABSTRACT

Background and study aims The aim of this study was to assess the effect of an educational video on the quality of bowel preparation of patients from a UK population attending for their first colonoscopy.

Patients and methods A prospective, endoscopist-blinded trial with 1:1 allocation was performed. Patients referred for their first colonoscopy were recruited between February 2019 and December 2019. All participants were prescribed Moviprep and received the trial site's standard written bowel preparation instructions, with the intervention group also receiving a bespoke educational video. Adequacy of bowel preparation (defined as a Boston Bowel Preparation Scale of ≥2 in each segment of the bowel) and polyp detection rates (PDRs) were compared. Fisher's chi squared test was utilized with P <0.05 as the threshold for significance.

Results A total of 509 participants completed the trial from six centers; 251 were randomized to the intervention group. The mean age was 57 years and 52.3% were female. The primary endpoint was met with an adequacy rate of 216 of 251 (86.1%) in the intervention group, compared with 205 of 259 (79.1%) in the control group (P <0.05, odds ratio [OR] 1.626, 95% CI 1.017–2.614). The PDR was significantly higher in the intervention group (39% vs 30%, OR 1.51, 95% CI 1.04–2.19, P <0.05).

Conclusions An educational video leads to improved bowel preparation for patients attending for their first colonoscopy, and is also associated with greater detection of polyps. Widespread adoption of an educational video incurs minimal investment, but would reduce the number of inadequate procedures, missed pathology, and the cost that both these incur.

Introduction

Colonoscopy is the gold standard investigation of the large bowel [1]. Adequate bowel preparation is the first vital step toward a good-quality colonoscopy [2, 3]. Poor-quality bowel preparation, however, is common, affecting up to 25% of procedures [4, 5]. This can lead to prolonged procedure duration and the need for an examination to be repeated. It also affects outcomes with a lower adenoma detection rate and an increased risk of both missed lesions and post-colonoscopy colorectal cancer [6, 7]. The quality of bowel preparation is influenced by several variables, including timing, type of bowel preparation utilized and patient-related factors [8, 9, 10]. Comorbidities, such as diabetes mellitus, constipation, liver cirrhosis, renal failure, and neurological disease can predispose to poor preparation [11, 12]. Furthermore, medications known to slow colonic transit, such as opioids and tricyclic antidepressants, are associated with inadequate cleansing [11]. Completing the bowel preparation regime can be challenging and is often cited as the worst aspect of the colonoscopic investigation [13]. However, good adherence is a key determinant of adequate cleansing, with incomplete compliance seen in almost half of patients with poor bowel preparation [14].

Improving understanding and motivation to undertake what is an essential, yet unpleasant, procedure is therefore vital. The effect of enhanced educational intervention using a variety of differing media has been studied. Enhanced written or face-to-face instructions, mobile phone applications, and educational videos have been investigated with results indicating the potential benefit on bowel cleansing [14, 15, 16]. The effect of educational videos has been investigated in North American and Asian populations [16, 17, 18]. Patients naïve to colonoscopy would have no prior experience of the bowel preparation process, making effective education more pertinent. In this study we planned to investigate the effect an educational video has on the adequacy of bowel preparation in a UK population of symptomatic patients having their first colonoscopy.

Patients and methods

Study design

This was a prospective, endoscopist-blinded, randomized, controlled, multicenter trial. The study design and planned endpoints were registered at https://www.isrctn.com (ISRCTN20368092). Six UK sites participated in the study (Nottingham University Hospital NHS Trust, Sheffield Teaching Hospital NHS Foundation Trust, Chesterfield Royal Hospital NHS Foundation Trust, Sherwood Forest Hospitals NHS Foundation Trust, Royal Derby Hospital, and United Lincolnshire Hospitals NHS Trust). The study was funded by The Midland Gastroenterological Society and was supported by The National Institute for Health and Care Research.

Enrollment and allocation

Patients aged ≥18 referred for their first colonoscopy and receiving Moviprep were eligible for recruitment. ▶ **Table 1** lists the full eligibility criteria.

Verbal informed consent was obtained from all participants. Patients referred for colonoscopy from secondary care were approached regarding study recruitment. Eligible patients were provided with study information. Subsequently, participants gave their consent either in person or via telephone call, with verbal consent confirmed. Those recruited were randomized using sealed envelopes to either the intervention group, which had access to the educational video, or the control group. The allocation ratio was 1:1. Recruitment and allocation to groups was undertaken by the local research team of nurses and doctors at each site. Participants were instructed not to inform any of the endoscopy team of their allocation. All participants were also provided with their site's standard-of-care written instructions for colonoscopy preparation.

Video design

The educational video was developed in collaboration with Nottingham Trent University Graphics Department. A patient and public participation group provided feedback about the content and theme of the video. Drafts of the video were further reviewed with feedback utilized to undertake further editing. Subsequently, a pilot of the study was undertaken at two of the sites and feedback from patients involved was used to further inform on the content of the video. Alterations were made to the scenes in the video describing the timing of preparation and pre-endoscopy diet to correspond with each site's standard written instructions. Development of the video cost £1385. The educational video was made available for the intervention group participants via either an internet link or in DVD format. Hyperlinks to the site-specific educational videos are found in the references [19, 20, 21, 22].

▶ **Table 1** Eligibility criteria.

Inclusion criteria	Exclusion criteria
Adult patients aged ≥18 years referred to secondary care and requiring a colonoscopy for investigation of their lower gastrointestinal tract	Patients with known Crohn's disease or colonic strictures
Able and willing to consent	Patients known to be intolerant of endoscopy
General fitness that is deemed sufficient to undertake colonoscopy	Lack the visual acuity allowing them to clearly read text and watch as well as clearly interpret a TV screen or computer monitor
Have access to either a DVD player or the internet	No access to the internet or a DVD playing device
Participant's first colonoscopy	Unable to understand English to a low intermediate level
	Listed for a colonoscopy by an endoscopist not involved in the study
	Unable to take the first-line bowel preparation Moviprep
	Possibility of pregnancy. If felt a possibility by the clinical team, a negative pregnancy test must be taken before enrolment in the study

Bowel preparation

All participants received Moviprep sachets to mix with 2 L of water (Each liter contains 100 g polyethylene glycol (PEG) 3350, 7.5 g sodium sulfate, 5.9 g sodium ascorbate, 4.7 g of ascorbic, 2.691 g sodium chloride, 1.015 g potassium chloride, aspartame, acesulfame potassium, and lemon flavoring). This purgative has been extensively investigated, with demonstration of its efficacy, and was the first-line bowel preparation for colonoscopy at each trial site [23]. Participants were instructed to drink this prior to their examination and follow a low-residue diet. The timing of bowel preparation consumption and the length of low-residue diet recommended differed between sites. Site instructions can be found in Supplementary Information 1. The content of the instructions at each site was the same for both the intervention and control groups.

Outcome measures

An intention-to-treat (ITT) analysis was used to assess the primary outcome in all evaluable participants completing the study. The primary end point was the adequacy of bowel preparation, defined as a Boston Bowel Preparation Scale (BBPS) ≥2 in each segment. The BBPS grades the preparation quality of the colon, divided into three segments, scoring 0 to 3 for each segment [24]. The BBPS has been extensively validated. A score of ≥2 in each segment has been associated with a lower polyp miss rate and an endoscopist-perceived need for repeat colonoscopy, and is accepted as a cutoff for adequate bowel preparation [2, 25]. The study was single blinded; the endoscopists who graded the bowel preparation were blinded to participant allocation. Endoscopists were provided with an online training video about grading BBPS. Endoscopist key performance indicators (KPIs) were compared between the groups, utilizing the recommendations from the British Society of Gastroenterology (BSG) on minimum and aspirational targets for number of procedures, cecal intubation rate (CIR), and polyp detection rate (PDR). BBPS was scored at the time of the colonoscopy by the endoscopist performing the examination, who also completed a non-segmental grading of bowel preparation (excellent, good, fair and inadequate). Participants completed questionnaires on the day of the examination. Secondary outcomes were also assessed. These were proportion of participants with excellent bowel preparation, mean BBPS, comparison of non-segmental grading of bowel preparation between groups, participant understanding of bowel preparation and colonoscopy procedure, satisfaction and comfort (measured using a visual analog scale [VAS]), PDR, total number of polyps detected, procedure length, CIR, performance in a bespoke bowel preparation quiz, and patient anxiety and satisfaction, and assessed using the Steinberger STAI-6 score (Supplementary Information 2). A post hoc comparison of bowel preparation adequacy (defined by BBPS ≥2 in each segment) between age group was conducted.

Statistical analysis

Participants were analyzed on an ITT basis. Fisher's exact Chi squared tests were used for comparison of bowel preparation adequacy and PDR. The Mann-Whitney U test or Student's *t* test (depending on the distribution of data) were used to compare the difference in means between the groups. As a secondary analysis, logistic regression was conducted to assess for factors associated with adequate bowel preparation. The saturated model included fixed effects for study group, age, sex, previous abdominal surgery, use of opioids, use of medications with anticholinergic properties, split dosing of bowel preparation, diagnosis of diabetes mellitus, frequency of bowel motions per week, and consumption of a low-residue diet prior to the colonoscopy as well as random effects for site. Backward elimination was used to reduce the final model, with sequential removing of non-significant factors. $P < 0.05$ was the threshold for significance. All endoscopy-derived outcomes were recorded at the time of the procedure. Other secondary outcomes were collected from questionnaires completed by the participants before and after their colonoscopies. Data were input into an Excel spreadsheet by each site. At the end of the study the data were collated and statistical calculations were under-

taken using IBM SPSS Statistics for Windows, Version 26.0 (Armonk, New York, United States).

Sample size

A sample size to assess the primary endpoint was calculated to obtain a satisfactory estimate with a significance level (α) of 0.05, a power of 80%, and an expected 8% improvement in the adequacy of bowel preparation. This improvement was based on previous studies investigating the effect of educational interventions on bowel preparation [16, 17]. As a result of the calculation, the sample size required per group was 260 patients. An anticipated dropout rate of 15 % was expected. Therefore, an estimated total of 600 patients was required.

Ethics approval

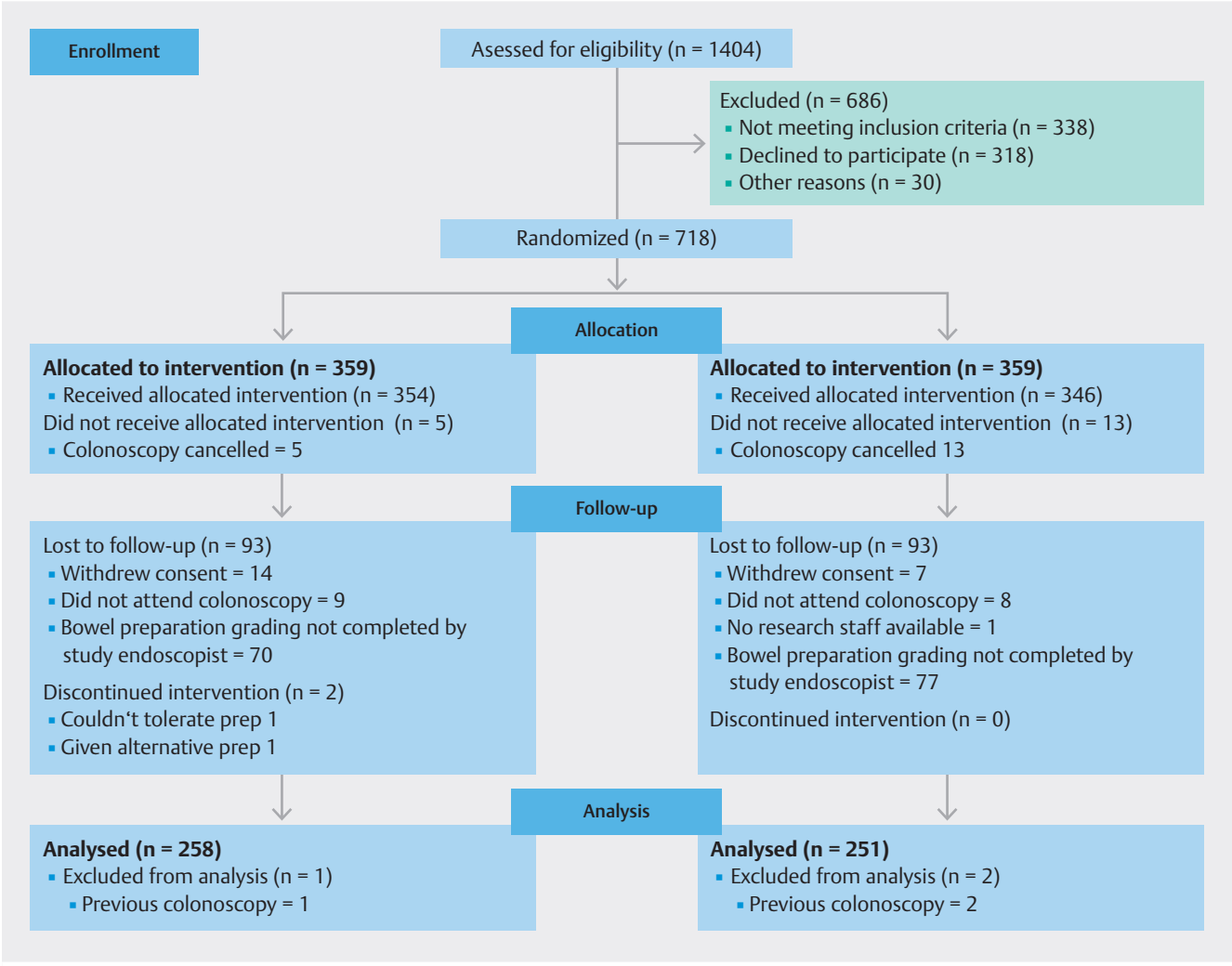
Ethics approval for the study was granted by North West – Greater Manchester West Research Ethics Committee (reference - 18/NW/0768).

Results

Participants were recruited between February 2019 and December 2019. A total of 1404 individuals were screened for eligibility; 718 agreed to participate and 209 withdrew. In total, 509 participants completed the study from six centers. The trial began in February 2019 and the recruitment period was extended from July 2019 to December 2019 due to insufficient recruitment. Of those completing the study, 251 participants were randomized to the intervention group and 258 to the control group. The mean age was 57 years (range 18–88) and 266 (52.3%) were female. The study CONSORT flow chart is shown in ▶ **Fig. 1** [26]. Demographic data for participants who completed the study are shown in ▶ **Table 2**.

A comparison between participant demographics and endoscopy outcomes in those that completed and withdrew from the study can be found in ▶ **Table 3**. Similar demographic factors and outcomes were seen although a higher rate of abdominal surgery was reported in the group that completed the study.

Most participants underwent endoscopy due to a change in bowel habits and there was no significant difference between



▶ **Fig. 1** CONSORT flow chart of study.

▶ **Table 2** Participant demographics.

	Control, % (n) N = 258	Intervention, % (n) N = 251	P value
Female	49% (127)	55% (139)	NS
Mean age	58 (SD = 15.05)	57 (SD = 15.1)	NS
Smoking	18% (47)	16% (40)	NS
Alcohol (mean units/week)	5.7 units (SD = 9.4)	6.4 units (SD = 9.1)	NS
Pre-endoscopy low-fiber diet	75% (194)	82% (201)	NS
Mean duration of low-fiber diet	2.58 days (SD 4.7)	1.98 days (SD = 4.1)	NS
Parkinson's disease	2% (6)	1% (2)	NS
Diabetes mellitus	12% (32)	12% (30)	NS
Cirrhosis	2% (5)	0% (1)	NS
Opioids	12% (31)	10% (24)	NS
Amitriptyline	6% (15)	8% (19)	NS
ASA >2	11% (27)	8.4% (21)	NS
Abdominal surgery	36% (90)	35% (87)	NS
Hysterectomy	8% (19)	7% (17)	NS
Constipation	12% (30)	10% (26)	NS
Morning procedure	49% (126)	58% (144)	NS
Split timing of preparation	67% (174)	63% (157)	NS
Exercise			NS
▪ Several times a day	8 (3%)	3 (1%)	
▪ Daily	48 (19%)	40 (16%)	
▪ 5 times/week	32 (13%)	26 (11%)	
▪ <5 times/week	40 (16%)	55 (22%)	
▪ Weekly	25 (10%)	28 (11%)	
▪ Rarely	99 (39%)	94 (38%)	
Education			NS
▪ University	92 (39%)	105 (45%)	
▪ College/A level	34 (14%)	24 (10%)	
▪ Secondary	108 (46%)	99 (43%)	
▪ Primary	3 (1%)	3 (1%)	

N, number of participants in each group; ASA, American Society of Anesthesiologists; NS, not significant.

the intervention and control group indications for their procedures (Supplementary Information 3). Endoscopists reported being unblinded in five cases (2%) in the intervention group and three cases (1%) in the control group, having been informed of group allocation by the participant. The proportion of endoscopists meeting the BSG KPI requirements and endoscopic experience were similar between the groups (Supplementary Information 4).

Bowel preparation adequacy

The primary end point was met with an adequacy rate of 216 of 251 (86.1%) in the intervention group, compared with 205 of 259 (79.1%) in the control group (OR 1.63, 95% CI 1.02–2.61, $P = 0.047$). There was no significant difference in the mean BBPS score between the two groups (control 6.78, 95% CI 6.56–7.00; intervention 6.72, 95% CI 6.52–6.92). The frequency of excellent bowel preparation between the two groups was similar (control 38%, intervention 35%). A lower rate of inade-

▶ **Table 3** Comparison of prevalence of risk factors and outcomes in participants who completed study and did not complete study.

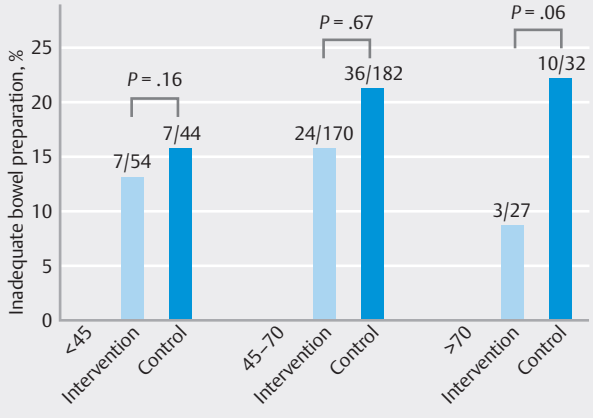
	Completed study	Did not complete study	Significance level
Sex (female)	52%	48%	NS
Age in years (mean)	58	60	NS
ASA >2	9%	5%	NS
Parkinson's disease	2%	1%	NS
Diabetes mellitus	12%	17%	NS
Cirrhosis	1%	2%	NS
Abdominal surgery	36%	20%	< 0.01
Amitriptyline	6.7%	10%	NS
Opioids	11%	15%	NS
Anticholinergics	15.3%	18%	NS
Constipation	11%	16%	NS
Split preparation dosing	65%	60%	NS
Adequacy rate as per non-segmental grading	93%	93%	NS
CIR	95%	94%	NS
PDR	35%	36%	NS

ASA, American Society of Anesthesiologists performance score; CIR, cecal intubation rate; PDR, polyp detection rate; NS, not significant.

quate bowel preparation was seen in the intervention group across all sites that participated in the study (▶ **Fig. 2**).

The proportion with adequate bowel preparation was higher in the intervention group in all age brackets. The age bracket with the highest absolute risk reduction for inadequate bowel preparation was the 70 + bracket with 13.5% although this did not reach statistical significance (OR 3.64, 95% CI 0.98–13.3) (▶ **Fig. 3**).

The non-segmental grading of bowel preparation was rated as adequate in 236 of 258 patients (91.5%) in the control group, compared with 237 of 251 patients (94.4%) in the intervention group, which did not reach statistical significance. The number of repeat examinations required due to inadequate preparation was comparable between the groups. The non-segmental grading and requirement for repeat colonoscopy due to poor preparation is shown in ▶ **Table 4**.



▶ **Fig. 2** Percentage of inadequate bowel preparation between age groups.

Endoscopy-related outcomes

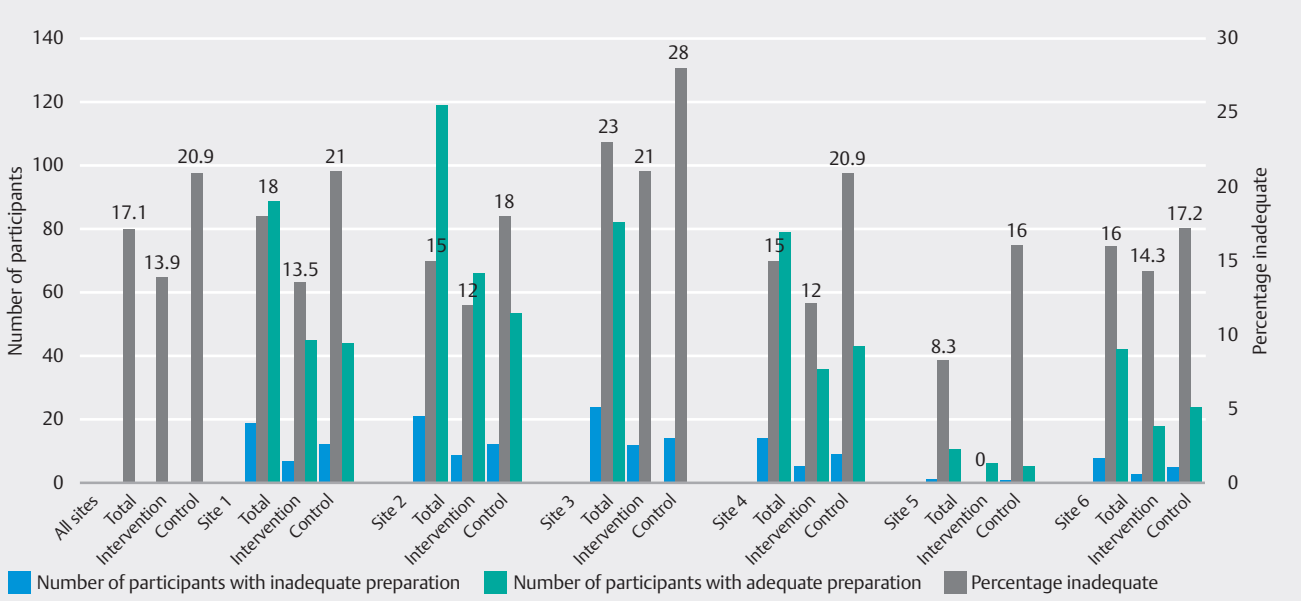
The PDR was significantly higher in the intervention group compared with the control group (39% vs 30%, OR 1.5, 95% CI 1.04–2.18, *P* = 0.03). In total, 220 polyps were detected in the intervention group, compared with 134 in the control group, with a mean number of polyps per procedure of 0.8 (95% CI 0.61–0.99) vs 0.52 (95% CI 0.4–0.64) (*P* = 0.02).

The CIR between the two groups was comparable (intervention group 96% vs control group 95%). The insertion times ranged from 3 minutes to 64 minutes with a mean of 14 minutes (standard deviation [SD] 6–22), with no significant difference between the groups. The withdrawal time ranged from 1 to 33 minutes with a mean of 10.8 minutes (SD 6.2–15.4). No significant difference was seen between the two groups.

Patient understanding, satisfaction, and adherence

The video was watched at least once by 90% of the intervention group. Of them, 89% rated its acceptability ≥7 of 10 (0 = unacceptable, 10 = very acceptable) with a mean score of 8.8 (SD ± 1.84).

Participants in the intervention group scored higher on the bowel preparation quiz (6 [95% CI 5.88–6.12] vs 5.6 [95% CI



▶ **Fig. 3** Number of participants with adequate and inadequate preparation, and percentage adequacy of preparation at different participating centers and in total.

▶ **Table 4** Non-segmental grading of bowel preparation in the EBOPS study and rate of repeat colonoscopy for poor preparation.

Non-segmental grade of bowel preparation	Control group n = 258 (%)	Intervention group n = 251 (%)	P value
Excellent	59 (22.9)	46 (18.3)	NS
Good	120 (46.5)	136 (54.2)	NS
Fair	52 (20.2)	52 (20.7)	NS
Inadequate	22 (8.5)	14 (5.6)	NS
Not reported	5 (1.9)	3 (1.2)	NS
Repeat colonoscopy for poor bowel preparation	10 (3.9)	9 (3.5)	NS

NS, not significant.

5.43–5.77], $P = 0.003$). In the intervention group 10% of participants reported not completing the 2 L of Moviprep, compared with 15% in the control group ($P = 0.16$).

Participant preprocedure anxiety scores tended to be lower in the control group, but this did not reach statistical significance (42.93 (95% CI 41.23–44.63) vs 45.32 (95% CI 43.62–47.02), $P = 0.051$).

The comfort and satisfaction scores were not significantly different between the groups (control 5.08; 95% CI 4.72–5.44 and intervention 5.38; 95% CI 5.04–5.72 and control 9.47; 95% CI 9.31–10.03 and intervention 9.37; 95% CI 9.06–9.58, respectively).

Backward elimination logistic regression identified factors associated with inadequate preparation. The use of anticholinergic drugs was associated with poorer preparation, whereas access to an educational video, female sex, and split bowel preparation led to improved cleansing (▶ **Table 5**).

Discussion

Effective patient education is a key tool to optimize bowel preparation for colonoscopy. This is the largest randomized controlled study to date to investigate the effect of an educational video on bowel preparation adequacy, and the only such study to be conducted over more than two sites. It is also the first study assessing the utility of an educational video for patients attending their first colonoscopy. However, a significant number of participants did not complete the study, which also led to the target size of the study population not being met. Among those that completed the study, participants attending their first colonoscopy with access to an educational video had a higher rate of adequate bowel preparation compared with standard instructions alone, with a number needed to treat to prevent one inadequate bowel preparation of 14. However, both the mean BBPS and the non-segmental grade of preparation were similar between the two groups. A significantly great-

▶ **Table 5** Logistic regression analyses of factors associated with adequate bowel preparation

Variant	Odds ratio	Significance level	95% Confidence interval
Access to educational video	1.83	0.017	1.11 to 3.00
Anticholinergic medication	0.36	0.002	0.19 to 0.68
Female sex	1.85	0.015	1.13 to 3.02
Split dosing of bowel preparation	2.33	0.001	1.39 to 3.88

er PDR was also observed in the group with access to the educational video. Although both groups were broadly similar, logistic regression indicated that the beneficial effect of the educational video was more significant than seen, largely due to a greater number of participants receiving split bowel preparation in the control group. However, the strength of these findings is restricted by the limitations of this study.

Although a significantly greater number of participants had adequate preparation, as demonstrated by the BBPS, this was not also seen when comparing using a non-segmental grading system. However, segmental grading scores such as the BBPS have been demonstrated to be more closely aligned with KPIs such as PDR than non-segmental grading scores such as the Aronchick score [24]. The BBPS is also more sensitive to inadequate preparation. A considerably larger cohort would be required to demonstrate a difference in adequacy using a non-segmental score.

Although a higher rate of adequate preparation was seen in the video group, mean BBPS score between the groups was not different, which challenges the efficacious benefit of the intervention. However, Clark and Kluge demonstrated that segments scoring <2 in a BBPS was the key factor in polyp detection, and a BBPS of 3 conveyed little additional benefit, indicating the importance of adequate segmental adequacy [2, 25].

A comparison of the two groups included a comprehensive assessment of risk factors for poor bowel preparation. Risk factors for poor bowel preparation play a pertinent role in overall bowel cleansing quality [11, 12]. The equivalence demonstrated between the two groups, therefore, reduces the risk of confounders skewing the results. However, the relatively high proportion of participants that did not complete the study limits the study's strength. Although a comparison of those that did and did not complete the study demonstrated broadly similar characteristics, a higher rate of abdominal surgery was seen in the participants who completed the study, indicating a possible systematic difference between the groups. This difference may relate to how the data were collected. Those that completed the study prospectively recorded their surgical history, whereas those that did not had the data retrospectively collected from their clinical case notes. Motivation and understanding are both required to complete bowel preparation [27, 28]. This educational video was specifically designed to encourage adherence and convey the required information about both the bowel preparation regime and colonoscopy itself. The content of the educational video was equivalent to the standard written instructions, thus the benefit demonstrated relates to the media form rather than additional information provided.

Being naïve to colonoscopy increases the need for sufficient information provision and appropriate education. It appears that enhanced education plays a key role in this patient group. It could be assumed that a multimedia intervention of this sort would be more accessible to younger users who would be more "tech-savvy," thus receiving the greatest benefit. This was found in a study by Jeon et al, who investigated the effect of an educational mobile phone application. They demonstrated the greatest benefit in patients aged <40 years [29]. This was not seen in our study. Participants in the group aged >70 derived, comparatively, the greatest benefit, with an almost 3-fold reduction in inadequate bowel preparation when compared with the control arm matched for age. Although the difference in adequacy within each group did not reach statistical significance, the study was not powered to demonstrate this difference. In our study participants were required to have the means to access the video in order to be eligible. As such, it may be accessibility to the educational interventions, rather than the intervention itself, that limits the benefit that is derived by older participants. Only 54% of individuals aged >75 years have access to the internet compared with 99% of 16- to 44-year-olds in the UK [30]. Our cohort required access to the internet or a DVD player for inclusion in the study, and therefore, may not be representative of the population as a whole. Age is known to be a risk factor for poor preparation. This in part is due to higher rates of comorbidities, polypharmacy, and constipation. However, adequate provision of information and education about how to undertake bowel preparation is a modifiable factor that should be optimized in this group [11].

The effect of educational videos on bowel preparation has been assessed in previous studies. Prakash et al conducted a randomized controlled trial recruiting 147 patients from two sites in the United States and randomized them to either an educational video or standard care alone. This study used the Ottawa Bowel Preparation Scale (OBPS) which has similarities to the BBPS, but a lower score signifies a superior view. The intervention group had a significantly lower mean OBPS score (4 vs 5, $P = 0.0002$) as well as a lower rate of inadequately prepared colonic segments (2 [1%] vs 28 [14%]). A confounding factor in this study was that there was a significantly higher number of well-educated participants in the intervention group (65% vs 39% with college or higher education) because education predisposes to better adherence to instructions regardless of the manner in which they are provided [18]. Two further studies

were conducted by Park et al and Pillai et al in divergent populations. Park et al recruited 500 South Korean participants from one center who were undergoing screening, mostly with a highly educated background and only 6% less than a high school education [16]. In contrast, Pillai et al recruited 152 North American participants, 76% of whom were African American and 90% of whom had less than a high school education [17]. Both studies demonstrated a significant improvement in bowel preparation with lower mean OBPS score in the group with access to the educational video, as well as higher proportions of excellent preparation and lower proportions of inadequate bowel preparation. In our study, the ethnicity was majority White British. A total of 38.7% patients had received at least a university education, and the level of education was equivalent between the cohorts. Although enhanced educational interventions are recommended by The European Society of Gastrointestinal Endoscopy [31], no prior studies of the effect of educational videos have been conducted in Europe. This study provides evidence of the applicability to this patient population.

All participants were provided with Moviprep as a bowel purgative, but across the trial sites, different regimens were utilized for both timing of preparation and length of low-residue diet. This study was consistent with previous evidence that split bowel preparation leads to better cleansing than day-before preparation [32, 33]. Only two sites split bowel preparation for morning procedures, whereas all sites utilized split bowel preparation for afternoon and evening appointments. Despite this, a higher rate of adequacy was seen in the intervention group at all sites. This indicates that enhanced education with a video leads to a step change improvement in preparation, irrespective of the specifics of the bowel preparation regimen. A recent survey of bowel preparation practice in the UK demonstrated that 93.1% of endoscopy units did not provide split bowel preparation for morning procedures [34]. An educational video would provide benefit to these variations in practice.

Bowel preparation quality is dependent on several factors. Sex, age, bowel frequency, comorbidities, and medications have an effect, as do variations in the regimen utilized: type and timing of preparation, as well as the nature and duration of diet that is advised [5, 11, 35]. This study was consistent with previous findings, with male sex, use of anticholinergic drugs, and day-before timing of preparation associated with poorer cleansing. Not all risk factors are modifiable, but effective educational intervention is a simple, risk-free, globally available way that bowel preparation can be improved. Augmented regimens of high-volume purgative, additional laxatives, and prolonged low-residue diet have been utilized in patients at risk of, or who have previously had, poor bowel preparation, and have been demonstrated to be beneficial in patients with prior inadequate bowel preparation [36, 37]. Gimeno-Garcia et al did not demonstrate a benefit of an augmented regimen in those prospectively assessed to be at a high risk of poor cleansing [38]. Enhanced education may be even more crucial in this group due to the increased complexity of instructions used for augmented regimens, and this is an area deserving of further research.

Limitations

Due to the nature of the study, the participants could not be blinded to their allocation. Participants could not be allocated to specific lists due to operational constraints at the trial sites. Because such a large group of endoscopist observers was required to capture participant endoscopy outcomes, however, the distribution to both participant groups was equal between the differing KPI standards of these endoscopists. Despite this, 20% participants could not be followed up to the conclusion of the study due to allocation to lists with endoscopists not involved in the study. This dropout rate may introduce an element of bias to the results. However, retrospective demographic data collected about these participants (▶ **Table 3**) demonstrate similar characteristics to those that completed the study. The higher rate of abdominal surgery may be explained by the difference in data collection. Although the target recruitment was reached, the rate of drop out from the study, therefore, was higher than expected, leading to a smaller-than-planned sample size in the final analysis, increasing the possibility of a type 2 error.

Conclusions

An educational video is a relatively simple intervention that can be easily disseminated and viewed. It has been demonstrated to be beneficial in all age groups across varying bowel preparation regimens, with the greatest incremental benefit for the intervention seen in patients aged >70 years. It leads to an improvement in bowel preparation as well as overall procedure quality, evidenced by a superior PDR. Widespread adoption of such an educational tool for preparation for colonoscopy is a simple, cheap, and effective way to achieve significant improvement in quality and should be part of the standard of care for bowel preparation.

Acknowledgement

The EBOPS study group: Baig F, Franklin J, Amin M, Pradhan S, Beg S, Crooks C, Jawhari A, Lewis N, Moran G, Oppong P, Norman A, Whitehouse D, Saha S, Kelsey G, Babu S, Amarnath T, Abdulrehman A, Elphick D, Narula H, Naylor G, Sakellariou V, Ardley R, Gupta R, White T, Barnett H, Haywood E, Pettman M, Al-Joudeh A, Amin S, Aziz I, Ball A, Basu K, Campbell J, Challand C, Chapple K, Chew T, Ching H, Davis G, Dixon S, Donnelly M, Hale M, Hegade V, Harikrishnan A, Hunt L, Johal S, Kurien M, Lam C, Loganathan, Rej A, Sidhu R, Tai D, Benfield S, Dube M, Ernest S, Hudson S, Kalogeri C, Menon A, Sharratt C, Mohamed K, Wireko M, Das R. Many thanks to Bobby and Billy Heaney who developed the educational video, and all the endoscopy staff, research nurses and the study participants who made the trial possible.

Conflict of Interest

Adolfo Parra-Blanco: Norgine Pharmaceuticals Ltd. Donation of equipment for research. The remaining authors have no conflict of interest to declare.

Funding Information

Midland Gastroenterological Society

Clinical trial

ISRCTN.org (http://www.isrctn.com/)
Registration number (trial ID): ISRCTN20368092
Type of Study: Randomised

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