Abstract of dissertation entitled

“On the Use of Supplementary Educational Materials to Enhance Adherence to Home Bowel Preparation in Adults undergoing Colonoscopy”

Submitted by

Chan Carol

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In the local setting of a colorectal surgical unit of a public hospital in Hong Kong, a fact sheet with written instructions of diet preparation and in-patient bowel preparation is provided to patients undergoing out-patient colonoscopy. However, bowel cleanliness reminded unsatisfactory with 14% of patients having poor bowel preparation, and there is increasing trend of staff workload due to increased public awareness and incident rate of colorectal cancer. Therefore this dissertation is aimed to investigate and design an effective patient education method with evidence support.

A search of Pubmed, CINAHL and Medline identified five relevant randomized control trials, which were critically appraised by using SIGN (Scottish Intercollegiate Guidelines Network) checklist for randomized controlled trials. Four out of five RCTs suggest that there is significant improvement of bowel preparation quality hence colonoscopy quality. In addition, design of material is an essential element which
affects it effectiveness.

A high similarity of clinical setting was found between the local setting and that considered in the identified studies. With existing resource and technique available in local hospital, the innovation is feasible. However a greater effort is needed when obtaining administrative support. Apart from improvement of patient outcome, nurse workload and cost can be reduced by 99% of expenditure.

Before commencement of new practice, a half-year pilot test will be conducted in a surgical ward with 30 eligible patients. Patient outcomes i.e. bowel preparation quality and colonoscopy quality, will be assessed by Boston Bowel Preparation Scale and polyp detection rate. Subjective evaluation from patients and nursing staff will also be collected. After that, an annual evaluation will be conducted to monitor the cost-effectiveness of new practice and 175 patients will be recruited for assessment. The new practice with innovation will result improvement in bowel preparation quality and colonoscopy quality that achieves 93% of satisfactory BBPS results. Participation rate of new practice will reach 90% corresponding to overall patient characteristics. Besides, feedback from staff towards new practice will be positive. An obvious reduction of expenditure will also be attained as estimated.
On the Use of Supplementary Educational Materials to Enhance Adherence to
Home Bowel Preparation in Adults undergoing Colonoscopy

By

Chan Carol

BN, RN

A thesis submitted in partial fulfillment of the requirements for
the Degree of Master of Nursing
at The University of Hong Kong
Declaration

I declare that this thesis represents my own work, except where due acknowledgement is made, and that it has not been previously included in a thesis, dissertation or report submitted to this University or to any other institution for a degree, diploma or other qualifications.

Signed…………………………………………………

Chan Carol
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Also, I would like to show appreciation to my colleagues and friends by sharing their working experience related to my thesis topic. Last but not least, I would like to give special thanks to my beloved for his continuous support, encouragement as well as patience throughout my thesis.
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Chapter 1: Introduction

1.1 Background

In Hong Kong, colorectal cancer is the most common cancer with increasing trend in incidence rate and crude death rate (Center for Health Protection, 2012; Hong Kong Cancer Registry, 2011). In 2011, there were 4450 new cases and 1904 deaths. Colonoscopy is the gold standard in colorectal tumor detection and diagnosis. It also has therapeutic use in the removal of colonic polyps and lesions. The effectiveness of colonoscopy depends on multiple factors such as the type of endoscope (i.e. narrow band imaging), skills of physician, patient's general condition and bowel cleanliness. Incomplete bowel cleanliness is a common cause of poor quality colonoscopy, which may reduce tumor/polyp detection rate, resulting incomplete colonoscopy, prolonged procedure duration, and increased costs if repeated colonoscopy required (Jae & Hoon, 2014). Results from Harewood et al. (2004) show that patients tend to over-estimate their bowel preparation quality, which may cause non-compliance of bowel preparation and affect the bowel cleanliness. From a study done in Asia, non-compliance to instructions contributes the main risk factor of poor bowel preparation especially in out-patients (Chan et al. as cited in Lui et al., 2014)
1.2 Affirming the Need

I was working in a colorectal surgical unit of a public hospital. There were some patients admitted to my ward who scheduled for repeated colonoscopy with poor bowel preparation as common cause. On the other hand, when I discharged some patients with out-patient colonoscopy appointment, I encountered that some patients cannot fully understand the diet instructions and bowel preparation procedure.

In current practice of this hospital, either medical unit or surgical unit, for patients who are going to be discharged from hospital with a scheduled out-patient colonoscopy appointment, the nursing staff will provide a written fact sheet of diet instruction (Appendix 1) and an admission slip to day center for undergoing bowel preparation in the morning before colonoscopy. However, patients with noncompliance to either diet instruction or bowel preparation were noted in both departments. A clinical audit conducted in 2005 reported that there was 13.8% of unsatisfactory bowel preparation in 1541 cases undergoing colonoscopy in Medical Departments of all public hospitals in Hong Kong from January to March 2002. Poor bowel preparation also contributed 26.7% to the cause of incomplete colonoscopy (Szeto, 2005).
On the other hand, since patients are required to admit to day center for bowel preparation in morning, and colonoscopy was done in afternoon section. Patients have to stay in hospital for full day and some patients complain that they find hard to apply a full day leave from work for colonoscopy.

To conclude, current practice of bowel preparation education in my hospital cannot facilitate patients’ bowel cleanliness for colonoscopy effectively and causing non-compliance to bowel preparation or diet instructions. Also it is time consuming for patients to perform bowel preparation in hospital.

1.3 Objectives and Significance

This dissertation aimed

1. To collect evidence of effective patient educational interventions to improve patients’ adherence to bowel preparation instructions.

2. To tailor-made an evidence-based patient educational material for target patients in local setting

3. To assess the feasibility of the innovation.

4. To monitor effectiveness of innovation by conducting a pilot test and regular evaluation.
Potential benefits

Home bowel preparation can promote self-control of progress and greater satisfaction by doing at familiar environment with adequate information and instruction provided. Also the length of hospital stay can be shorten as bowel preparation was done at home before attending to endoscopy center, hence anxiety can be reduced when patient received more information related to the procedure. Once there is a practice of home bowel preparation, workload of nursing staff in pre-colonoscopy stage can be reduced which they are free from monitoring the progress of bowel preparation for every patients and less stress on manpower in providing counseling to patients who unfamiliar or uncooperative with bowel preparation instructions.

For economical consideration, although cost and manpower may be required in the initial stage of designing patient education material, there is low operational cost afterwards (Refer to part 3.1.4). With improved quality of colonoscopy, fewer patients require a repeat colonoscopy, hence, less cost and manpower consumed. Also, due to shortage of health care professionals in Hong Kong, the mode of patient education would be in form of materials rather than personal consultations that can avoid increasing the burden of manpower shortage (Hearn. et al., 2000).
Chapter 2: Critical Appraisal

2.1 Search and Appraisal Strategies

In order to search significant evidence to develop a new educational material related to patient education on bowel preparation and colonoscopy, searching and appraisal strategies were set to ensure the supporting data were relevant. Randomized control trials were selected from three major electronic databases in medical field, i.e. Pubmed, CINAHL and Medline. Keywords were identified to facilitate journal searching. The search keywords used were “education”, “bowel preparation” and “colonoscopy”. In order to narrow down search results, potential citations were selected by reading the title of studies from the results of keyword searching, and then further screened by reading abstract and full text of the studies. To expand the possibility of searching relevant studies, reference list of selected citation were also screened through as previous order, i.e. from title to full text reading. Besides, there were exclusion and inclusion criteria set to aid screening of search results.
Inclusion criteria:

1. Study design is a randomized controlled trial.
2. All modes of bowel preparation i.e. different bowel preparation medication.
3. Any type of supplementary educational materials.
4. Quality of bowel preparation as one of the measure outcome of study even if it is secondary outcome of study.

Exclusion criteria:

1. In-patient colonoscopy.
2. Any intervention involved human input e.g. telephone follow up, counseling etc.

As mentioned above, the aim of study is related to bowel preparation compliance, therefore the target primary outcome is quality of bowel preparation and secondary outcome is colonoscopy quality e.g. cecal intubation rate, insert time, polyp detection rate etc. To compare the results of different studies systemically, a table of evidence adopted from SIGN was created (Appendix 3) to summarize each relevant study and facilitate comparison in later part of this section. Beside of content of studies, methodology of each study was appraised by using SIGN checklist for randomized
controlled trials (Appendix 2). SIGN (Scottish Intercollegiate Guidelines Network) is a programme which provides guidelines to conduct systemic review and translation of scientific studies and develop evidence-based clinical practice guidelines to improve our clinical practice and patient outcomes (SIGN, 2014).

2.2 Results

Journal searching for this dissertation according to above keywords and screening method with inclusion and exclusion criteria was done between 10 and 18 March 2014 through Pubmed, CINAHL and Medline electronic databases. In Pubmed, there are 99 citations from keyword search, and then 7 potential results was screened by reading study titles; potential studies were further selected by reading its abstract (3 results) and then full text to confirm the relevance of the study with the frame of this dissertation (3 results), in order to obtain more relevance studies, citation list of selected journal were also read through for relevance (total 5 results). The same searching method was done in Medline, i.e. 8 results from keyword search, 1 result from reading title, no result from reading abstract and full text. No result was found when doing keyword search in CINAHL. After that, searching results from these electronic databases were combined to exclude the duplicate studies and finally there were 5 studies which were relevant for critique and analysis for translation of practice.
Records identified through database searching (Pubmed: n = 99; Medline: n = 8) (n = 107)

Additional records identified through other sources (From citations) (n = 2)

Records after duplicates removed (n = 109)

Records screened (n = 10)

Records excluded (n = 99)

Full-text articles assessed for eligibility (n = 5)

Full-text articles excluded, with reasons (n = 5)

Studies included in qualitative synthesis (n = 0)

Studies included in quantitative synthesis (meta-analysis) (n = 5)

To summarize the findings from table of evidence (Appendix 3), these five selected studies were randomized control trials and studies were done between 2009 and 2013. For study design, there were one intervention group and one control group in each study; after interventions, patients were undergone colonoscopy and outcomes were assessed by endoscopists. For patient characteristics, mean ages of patients in four studies were older than 50 years old and some of the patients in three studies received previous colonoscopy. Furthermore, bowel preparation received in each study was different and even one study did not mention what type of bowel preparation medication was given to patients.

For intervention of studies, different educational materials in intervention group were used which four were printed image with words and one was video (Prakash et. al., 2013); while for control group, four studies were written instruction with verbal explanation and one study with video and question and answer session (Spiegel et. al., 2011). On the other hand, mode of application of interventions were different, four intervention group of studies received standard education and addition educational material, one intervention group (Tae et. al., 2012) of a study received educational material only.
Furthermore, some studies were using different measuring tools for their outcome measures. Study using educational pamphlet by Shaikh et al. (2009), bowel preparation quality was measured by subjective evaluation and resulted significant improvement; colonoscopy quality was measured by completion rate and with significant improvement. Study using simple visual aid by Calderwood et. al. (2011), bowel preparation quality was measured by subjective evaluation and Boston Bowel Preparation Scale showed no improvement but the result was not statistically significant; colonoscopy quality was measured by polyp detection rate, insertion time and withdrawal time also showed no improvement but not statistically significant. Study using novel patient educational booklet by Spiegel et. al. (2011), bowel preparation quality was measured by Ottawa score and Likert Score and both resulted significant improvements; while result of colonoscopy quality was not measured, and it only mentioned that there was evidence of linear relationship between bowel preparation Likert scores and polyp detection rate (colonoscopy quality) from other research evidence. Study using cartoon visual educational instruction by Tae et. al. (2012), bowel preparation quality was measured by Boston Bowel Preparation Scale and Universal Preparation Assessment Scale and both showed significant improvements; colonoscopy quality was measured by polyp detection rate, insertion, withdrawal and workup time and with significant improvements except insertion time.
Study using online educational video instruction by Prakash et. al. (2013), bowel preparation quality was measured by Ottawa score showed significant improvement but there is no measurement done on colonoscopy quality.

In addition, after critical appraisal on methodology by SIGN checklist (Appendix 2), there is summary of the methodology of five selected studies. Four of the studies did not describe the method of concealment, but all studies mentioned that all patients, researchers and endoscopists and nurses were blinded to group assignment at the begin of study, and random assignment were done after patient recruitment and outcome measures were assessed by endoscopists who were blinded throughout the studies. These can avoid bias from researchers and endoscopists as they were unable to distinguish the patient group, so that they provided same treatment and standard of measurement to every patient.

Another issue is related to the sample size and drop-out rate. First, two studies did not mention calculation of required sample size (Shaikh et. al., 2009 & Prakash et. al., 2013) which three studies mentioned calculation of sample size and recruited adequate number of patients. On the other hand, two studies (Calderwood et. al., 2011 & Spiegel et. al., 2011) with drop-out rate were higher than 20% which may affect the
statistical significance of study results. In additional, only one study did intention to
treat analysis. This could affect the validity of intervention’s effect size, since there
were a part of patients within study groups were excluded or discontinued the studies
before data collection of measure outcomes, while they may be also received
treatment and their treatment results may be different from the study group. With
higher drop-out rate and absent of intention to treat analysis, validity of intervention’s
effect size will be affected.

Besides, significant initial difference between intervention and control group could
also affect the validity of intervention outcome that either one group may have better
results due to their own baseline characteristic but not the intervention received.
Therefore it is important to ensure that patient characteristic from both groups are
equal and the only difference should be the treatment received in order to measure the
true effect size of the intervention. Although, there was baseline data difference in
study by Parkash et. al. (2013), it is acceptable as they did data analysis and
concluded there was no significant correlation between related baseline data and
measure outcomes.

Therefore there are four studies commended as acceptable (+) according to SIGN
checklist and study by Calderwood et al. (2011) was rejected (0) due to its high drop-out rate (intervention group: 52.3%; control group: 50.8%) and no intention to treat during analysis the results.

2.3 Summary and Synthesis

Summary of study results

To summarize the results from five selected studies, there were four interventions showed significant improvement in bowel preparation quality by using different measuring scales. On the other hand, there were two interventions showed significant improvement of colonoscopy quality in terms of different aspects, for example, polyp detection rate, duration of colonoscopy. Besides, there are two studies which did not measure the quality of colonoscopy. And there is one intervention adopted by Calderwood et al. (2011) showed no difference on bowel preparation and colonoscopy quality when compared with control group while the results were not statistically significant and this study was rejected after evaluation according to SIGN checklist for randomized controlled trials.

Synthesis

As stated above, not all intervention suggested improvement in bowel preparation
quality and colonoscopy quality. There are two areas of concern when doing meta-analyses for these five selected studies.

Firstly, there is one intervention i.e. simple vial aid by Calderwood et. al. (2011) shows no improvement in both bowel preparation quality and colonoscopy quality. This may related to its high drop-out rate and absent of intention to treat in data analysis. Also the intervention was not well designed as the visual aid was endoscopic images of large colon to emphasize the importance on bowel cleanliness to colonoscopy, but there is no other visual aid designed to educate patients how to perform bowel preparation and which was different from other four studies.

Last but not least, mode of interventions had slight differences i.e. all are visual material, but also included audio as video in study by Prakash et. al. (2013). The design of material, type of picture or photograph, and audio quality could affect the effectiveness of intervention with the same reason for Calderwood et. al. (2011) study as above.

According to current available data, a supplementary material can improve patient compliance on bowel preparation, which in turn shows improvement in bowel
preparation quality hence colonoscopy quality. Design of the material is an essential element which affects its effectiveness. Pilot test is required to test the possibility of translating the intervention to local setting such as language translation to Chinese, add specific examples of diet instructions regarding to Chinese or Asian diet culture, and use standard and universal measuring tools etc. The plan of pilot test and evaluation will be discussed in chapter 4.

From studies by Shaikh et. al. (2009), Spiegel et. al. (2011), Tae et. al. (2012) and Prakash et. al. (2013), one of the patient factors for noncompliance to bowel preparation was anxiety induced by complicated bowel preparation instructions, colonoscopy procedure and previous unpleasant experience of bowel preparation and/or colonoscopy. Therefore the innovation, colonoscopy and bowel preparation education material needs to be informative and simple with visual supplement to facilitate understanding. Suggested from Tae et. al. (2012) study, use of cartoons and photographs in the innovation can facilitate patients to understand the instructions.

The target group of the innovation will be adult patients arranged with out-patient colonoscopy. The patients should be able to understand Chinese or English, without severer visual disability and no cognitive problem affecting comprehension. Details of
translation of intervention and application of the innovation will be further discussed in next two chapters.
3.1 Implementation Potential

3.1.1 Target audience and setting

My serving clinical setting is taking a main role to provide public endoscopy service to citizens of Hong Kong West and there are only two endoscope centers in this cluster. With increasing demand on service, workload of staff increases while the waiting list is getting longer. Average waiting time of elective colonoscopy in surgical department is from six to eight weeks. The endoscopy center in my hospital has six endoscopy rooms which are shared by medical teams and surgical teams. Colonoscopy is available from Monday to Friday afternoons and 10.5 sections a week. However demand of colonoscopy for tumor screening is having an increasing trend. From 2012 to 2013, there were 2616 out-patient colonoscopy in my hospital (medical: 901 cases; surgery 1715 cases) while, from 2013 to 2014, 2766 cases were done (medical: 884 cases; surgery: 1882 cases) (HKWC, 2014).

As explained in chapter 1, some of the patients presented with poor compliance to instructions which induced poor bowel preparation and needed a repeated colonoscopy later. On the other hand, performing bowel preparation in hospital day
Based on the systematic review in chapter 1, an informative educational material with visual aids (e.g. images, video) can enhance patients’ adherence to diet and bowel preparation instructions. The evidence-based practice can improve colonoscopy quality and shift the bowel preparation procedure from clinic to home setting.

In the following, implementation potential of evidence-based practice into local setting will be discussed according to its transferability and feasibility and estimate its cost/benefit ratio to weight the worthiness of replacing current practice with this new practice.

3.1.2 Transferability

Based on observation, most of patients receiving out-patient colonoscopy in my hospital are Cantonese speaking Chinese with primary or above level of education; their mean age is about 60 years old and 50% are male. All patients will be offered single dose of klean Prep (polyethylene glycol, PEG, 2-4 liters) for bowel preparation. Patients received a written diet instruction (Appendix 1) with an appointment slip for
colonoscopy. 80% of the patient underwent bowel preparation in day center in the morning before colonoscopy. Furthermore, about 70% patients do not have previous experience of colonoscopy.

To compare with these five selected studies, there are some similarities with the local setting. Educational materials were distributed when out-patient colonoscopy appointments were arranged which the materials were designed with their local language and English; age of target group is similar which focuses on middle-aged patients whereas mean age are ranged from 48 to 73 years old, except one study with younger age group i.e. 35 years old in Prakash et. al (2013). Difference in distribution of sex is not significant except Spiegel et. al. (2011) which 97% patients were male. Also PEG was used as one of the bowel preparation agents in three out of five studies (two studies with single dose and one study with split dose). In addition, evidence showed that the education material can apply to the patients without previous experience of colonoscopy as well as bowel preparation procedure. Therefore it is suitable to apply to local setting even though there are large portion of patients receiving their first colonoscopy. Current practice of my local setting for bowel preparation is under nurse supervision. With translation of latest evidence, the practice will be changed to patients’ self-control of home bowel preparation and which is the
aim of this dissertation to examine the possibility of applying the evidence based on
the similarity of patient characteristics and clinical setting.

According to Calderwood et. al. (2011) and Spiegel et. al. (2011), health belief model
was applied to promote patient’s health behavior by educating them the importance of
bowel cleanliness and consequence of poor bowel preparation, so as to promote
patient compliance of bowel preparation hence colonoscopy quality. My hospital also
focuses on patient centered care and takes measures to shorted length of stay in
hospital by reinforcement of patient self-care ability (HKWC, 2013). Therefore
applying the evidence into practice and shifting the bowel preparation procedure into
home-based have no contraindication to my hospital’s philosophy of care.

As mentioned in chapter 1, there are potential benefits to both patient and health care
system. Based on local patient characteristics stated above, the evidence-based
practice can apply to 90% of adult patients, therefore there are approximately 2000
patients in my hospital can perform home bowel preparation instead of current
practice for out-patient colonoscopy every year.

Before fully apply the evidence-based practice, a pilot test will be conducted to
examine the transferability of new practice in order to translate the evidence-based practice which suits local setting. It composes of three stages, first is preparation stage, then second stage is conducting pilot test, last stage is evaluation stage to judge whether the new practice can be adopt directly or further modification required.

First, as preparation stage, a month will be spent on developing a communication team in order to facilitate the communication process with different parties and gain their consensus and approval for new practice which details of team building and communication process will be elaborated in next chapter. Once approval is obtained, the pilot test will be launched. Design of educational material will be completed within one week. Then two weeks’ time is needed to contact with administrative services department, procurement and supplies section of hospital to arrange printing of educational materials. When the material are prepared, it will be distribute to a surgical ward for pilot test by use of portering service from hospital and which can be done within one day. After the educational materials are arrived the destination, a training session will be given to nurse trainers and the trainer will train the fellow nurses that totally half day will be used.

There are 30 patients will be recruited in the study to home bowel preparation group
for their colonoscopy who are selected by nurse according to the evidence-based practice guideline (Appendix 4). Assessment tools for patient outcomes will be adopted from evidences and assessed by endoscopists when performing colonoscopy, i.e. Boston Bowel Preparation Scale and polyp detection rate. From data collection (10 weeks) to analysis (2 weeks) that 3 months may be required. Then one week will be used to generate a report. Final version of new evidence-based educational material and report will be sent to managers and endoscopists to gain approval for change of practice. Details of pilot test will be introduced in next chapter.

With similarities in patient characteristic and setting, the evidence of patient education materials for home bowel preparation can be translated to fit my local setting. Therefore a pilot test will be conducted to prove its transferability and which totally about half year (about 20 weeks) is needed (Table 1).
Table 1: Time frame of pilot test

<table>
<thead>
<tr>
<th>Stages</th>
<th>Preparation</th>
<th>Pilot test</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Communication team building &amp; Promotion</td>
<td>Design</td>
<td>Produce &amp; Distribute &amp; Training</td>
</tr>
<tr>
<td>Time (week)</td>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

3.1.3 Feasibility

Apart from translating evidence to local setting, feasibility has to be considered whether the practice can be applied to the setting. Firstly, approval from administrative level is the most important factor to launch the change of practice, as well as consent from endoscopists to give autonomy for nurses to decide patients’ bowel preparation method based on their clinical judgment and nursing assessment. In turn, in case of possible failure or adverse effect, our hospital has a comprehensive communication and reporting system, Advanced Incident Report System, AIRS. The application of new practice can be terminated and reviewed when an incident is reported in AIRS and the report will be transmitted to administrative levels. However, the educational materials are given to patient along with their out-patient appointment in six to eight week in advance, there is a lag period for termination of practice and patients will be called back and rearranged colonoscopy appointment which will cause inconvenience and manpower is required to contact those patients. In addition, patients may suffer adverse effects which requires hospital admission e.g. drug allergy, adverse drug reaction, mistaken by children etc. Fortunately, adverse effect of bowel preparation is rare and education related to side effects, precaution and solution will be mentioned in the educational materials.
When commencing a new practice, resistance will meet even when making a small change. The new education material includes home bowel preparation technique besides diet instructions in the current information sheet. Nurses in the ward or SOPD need to spend more time on patient assessment and education. Some of the nurses may feel that it is troublesome and increases their workload by spending about three minutes more per patient to teach them about bowel preparation. Resistance also comes from endoscopists, since they may have concern on patient compliance to bowel preparation hence affects colonoscopy quality even if nursing assessment and education are given.

As stated above, administrative support affects whether a new practice can be implement. Our hospital is a teaching hospital for a university, which provides a good environment for clinical research and application of evidence-based practice. Specialty nurses of our hospital will get involved in nursing research and formulate protocols to improve our nursing practice e.g. wound management protocol, perioperative protocols for colorectal surgeries. However, support from administrative level is weak, especially for junior nurses who are not authorized to obtain official clinical data except by observation which could weaken the evidence level of their research. Besides, limited clinical data were published in hospital intranet due to
privacy or unknown reasons that increases the difficulty in reflecting the actual 
clinical problem observed. Communication and discussion with senior staff could 
help to gain support and evidence. Presenting the clinical problem to administrative 
levels and endoscopists to seek for opinion as early as research stage could facilitate 
the process of gaining their support.

In addition, availability of resource and skill are another factors affecting its feasibility. 
Since the educational material is a printed material, it can be easily arranged and 
printed within hospital department; less cost and time will be spent on holding public 
tender for choosing a printing company. Also, hospital portering service can be 
utilized for transporting the products. On the other hand, specific training is not 
required, since the educational material is an aid to assist the nurses to educate 
patients to perform home bowel preparation and assumed that all nurses already have 
related knowledge during their training in school. Lastly, to evaluate whether the 
evidence-based practice can be applied to local setting effectively, pilot test will be 
conducted; Boston Bowel Preparation Scale and polyp detection rate are adopted from 
evidence will be used to test its patient primary and secondary outcomes and which 
are proved as valid measuring tools for bowel preparation and colonoscopy quality 
(Calderwood & Jacobson, 2010; Pullens & Siersema, 2014).
To conclude, the evidence-based educational material for home bowel preparation is feasible to apply in local setting. However, challenge will be met when gaining administrative support especially if the search is done by a junior staff. More time and effort will be needed to gain support and reduce resistance from administrative levels, senior staff, and endoscopists.

3.1.4 Cost/Benefit Ratio

Before implementing a new practice, weighting its risk and benefit is important to ensure that it will not do harm and is more cost-effective than original practice. Since this new practice is to assist patients to perform home bowel preparation, which there is no health care professional to monitor the bowel preparation process. It can be a risk that patients fail to self-monitor early adverse effects of bowel preparation (e.g. severer vomiting, abdominal distension) according to the education material. Besides, patients’ refusal in complying with the instructions could also result in poor bowel preparation and a repeated in-hospital bowel preparation or rearrangement of colonoscopy appointment may be required. However, home bowel preparation can have potential benefits which stated in chapter 1, i.e. reduce workload of nurse in answering patient’s questions and monitoring their bowel preparation progress (approximately 5 hours per patient). In addition, patients can have less stress and
avoid infecting or spreading of bacteria by using public toilets, and it can shorten waiting time of colonoscopy.

On the other hand, hospital expenditure on bed occupancy, nursing staff, sewage and drinking water will be reduced by replacing the current practice, since my hospital spends about two million dollars each year for in-patient bowel preparation (Appendix 5). While the cost of using educational material is much lower whereas material and operational cost are less than twenty thousand dollars. In a calculation of material cost versus operational cost of using evidence-based educational material for home bowel preparation (Appendix 6), about HK$17,000 will be spent for every year as operational cost, but it is affordable when compared with current practice. Therefore, evidence-based educational material for home bowel preparation is more cost-effective than current practice; it is worth to apply this new practice for local setting.
3.2 Evidence-based Practice Guideline

Based on latest relevant evidence, recommendations will be extracted from the evidence which is applicable to local setting. This guideline is formulated for translate the evidence to design an evidence-based education material and assist the nurses to identify eligible patients and provide evidence-based practice (Appendix 4).
Chapter 4: Implementation Plan

4.1 Communication plan

4.1.1 Identification of Stakeholders

There are three levels of audience for communication plan which are administrative staff, service providers and patients. Administrative level includes ward managers, department managers and endoscopists, official approval from this level is essential in order to obtain authority to utilize hospital resources (e.g. computers, printing service, portering and manpower) and apply practice to patients by requesting the nursing staff to follow the evidence-based guideline.

Service providers (nurses) include the trainers of new practice; support from trainers can help to encourage other service providers i.e. trainees (fellow nurses) to comply with new practice with confidence.

Last but not least, recipients of new practice are the patients and their caregivers who are going to have out-patient colonoscopy. Communication will be provided by service providers and giving education and encouragement to the patients that can reinforce them to perform home bowel preparation and ensure achievement of
expected outcomes which are beneficial to patients and health care system.

4.1.2 Communication process

As briefly mentioned in previous chapter (Table 1), approximately a month will be spent on communicate with administrative staff and trainers of service providers to gain their support and authority; the person who initiate the change act as a promoter. Firstly, idea of innovation will be presented to supportive ward manager by promoter and seek approval to start the change of practice. An hour of discussion will be conducted which focuses on local clinical problem of poor out-patient bowel preparation quality and the increasing workload of staff in day center, and then shares a possible solution with evidence-based plan of change i.e. home bowel preparation education to the ward manager.

Secondly, promoter is responsible to invite different levels of staff as communication team members in order to facilitate a smooth process in gaining support from every stakeholder. First, the ward manager who approves the change as mentioned above will be invited as one of the communication team member. In order to gain support from endoscopists, recruiting at least one endoscopist could help and which a familiar and friendly one will be approached first. By focusing on current patient bowel
preparation quality as well as increasing expenditure and waiting time of colonoscopy appointment, consensus could meet after having an hour of discussion with the endoscopist. Then promoter will suggest a more effective practice with evidence and ask the endoscopist to be a member of communication team. On the other hand, to speed up the transmission of message of new practice among nurses, two acquainted fellow nurses will be invited as well by showing them the benefits for nurses from new practice in terms of reduction of overall workload and increased job satisfaction by delivering education to patients. Total two weeks are needed to build up a communication team.

After building up a communication team, introduction of new practice to nursing staff will be done by promoter and nurses in communication team and holding a 10 minutes presentation with question and answer section in each related ward and clinic so that nurses can have brief idea of new practice and reduce their resistance to change, which a week is needed. While ward manager of communication team helps to communicate with other ward managers and they will be responsible to nominate nurses as trainers of practice for each ward/clinic. The ward manager is also responsible to communicate with administrative level to gain their support and cooperation with other department i.e. medical department, surgical department and
out-patient department for standardization of evidence-based practice. It will require a week to contact all administrative staff. Once the all administrative approved the change of practice, the evidenced based practice will present to endoscopists during team meeting by the endoscopist of communication team (30 minutes) and inform the plan of change as well as invite them to assist in assessment of patient outcome by using Boston Bowel Preparation Scale (BBPS) (Appendix 7) and polyp detection rate (Appendix 8).

4.2 Pilot study plan

4.2.1 Objectives

Before fully apply the new practice to local setting, a pilot study should be conducted and its objectives are listed below:

1. To test the feasibility and transferability of application of new practice in local setting.

2. To assess the possible difficulty and solution when applying the new practice to local setting.

3. To assess areas for modification of new practice to suit local setting.
4.2.2 Plan design

Totally about three weeks will be spent in preparation stage to design and prepare the educational materials, guidelines and training of the staff. After the communication team gets success in gaining support from different parties, the promoter is going to design the home bowel preparation material according to the evidence-based practice guideline and prepare copies of the guideline for reference in each related wards and clinics. For the educational material design, it will be designed as a leaflet with color printing and with English and Chinese version. Printing and distribution of material will be done by related department of hospital as introduced in previous chapter.

To facilitate patient education for nurses, specific teaching materials will also be arranged e.g. a magnified version of educational leaflet for patient with mild visual impairment; measuring jar, bottles and cups for demonstration of preparing bowel preparation medication. In order to enhance compliance of nurses, training of trainers is needed to facilitate the change and act as a role model. Five trainers will be nominated by ward managers, who represent each related wards (three nurses), special outpatient clinic (one nurse) and day center (one nurse). A 30 minutes briefing section will be given to them, for example, explaining the evidence-based practice guideline to the trainers so that they will be able to assess and identify target patient of
new practice as well as introducing the content of educational leaflet which can facilitate their patient education process. On the other hand, trainers from day center will be trained to assess the target patients whether they have completed home bowel preparation successfully and give solutions for those patients who do not complete home bowel preparation that they will continue the bowel preparation in day center and postpone colonoscopy to afternoon section or rearrange another day of colonoscopy if afternoon section is full. After training the trainers, the trainers then will deliver the message and train the fellow nurses in their own wards or clinics. A case study with role play will be conducted after training section to test whether the fellow nurses understand the new practice and assess their ability in troubleshooting. This training to fellow nurses may require one and a half day. Besides, for outcome measurement, an online video link of introducing Boston Bowel Preparation Scale (Appendix 7) will be distributed to all endoscopists for training by the endoscopist from communication team and this method of training is simple and effective which has been used worldwide (Calderwood et. al., 2010; Kim et. al., 2014).

Three months (12 weeks) will be used to conduct a pilot study, from patient selection to data collection for analysis. The pilot study will apply in one surgical ward. Patient selection is done by trainer and two fellow nurses based on evidence-based practice
guideline, i.e. adult patients who arranged with out-patient colonoscopy appointment and able to understand English or Chinese and follow the instructions. With a verbal consent, the first 30 eligible patients will be recruited into the pilot study. Patients who agree to join the pilot study will be arranged with a morning section of out-patient colonoscopy and nurses will provide education with innovated educational leaflet as reference. So that those patients will be discharged with an out-patient colonoscopy appointment, educational leaflet, medication for bowel preparation, and admission slip to day center for the day of colonoscopy with remarks to identify patient is in pilot study group. A name list of pilot study patients will be distributed to nursing staff of day center for identification and endoscopists will assess patients’ bowel preparation quality (BBPS) (Appendix 7) and colonoscopy quality (polyp detection rate) (Appendix 8). The results will be collected by endoscopist in communication team for data analysis and evaluation by making comparison with patients under current practice. On the other hand, nurses from communication team will collect patients’ subjective evaluation of their home bowel preparation experience in day center by using an evaluation questionnaire (Appendix 9) on the day when patients admit to day center for colonoscopy. Comments from nurses will also be collected at the end of pilot test by promoter and nurses from communication team.
Within three months of pilot test, two weeks will be spent for data analysis and evaluate the new practice whether any revision or clarification needed. Comparison of BBPS and polyp detection rate between study group and current data will be done and home bowel preparation practice is expected to perform better, i.e. higher percentage of patient with BBPS $\geq 5$ and higher polyp detection rate. In addition, overall subjective evaluation from nursing staff and patient should be positive as well as their comments will also be summarized and look for any necessary modification of practice or educational leaflet. Furthermore, AIRS will be reviewed and searched for any accident or adverse side effect reported during pilot test by ward manager of communication team and consider whether terminate or continue the pilot test depending on its severity and frequency. Then a full report will be generated and sent to administrative level and endoscopists within a week. With proven transferability and feasibility of new practice, the results of pilot test can allow the administrative level to consider change of current practice.

4.3 Evaluation Plan

4.3.1 Objective

Even though there is success from pilot test and gaining approval to change practice, it is essential to perform regular evaluation to monitor its effectiveness. Objectives of
evaluation plan are listed below:

1. To monitor expected benefits obtained by using of new practice.
2. To sustain the change by regular review of outcome and update of evidence.
3. To make further improvement or adjustment of practice depends on latest clinical environment.

4.3.2 Outcome

As hospitals in this cluster has official annual statistic evaluation on number of out-patient colonoscopy, therefore patient demographic data and outcome evaluation of home bowel preparation can also be measured annually as well. Outcome evaluation includes patient outcome, nurse outcome and health care system outcome.

Primary patient outcome is bowel preparation quality and secondary outcome is colonoscopy quality. Boston Bowel Preparation Scale is a valid and reliable assessment tool to rate the cleanliness of bowel for colonoscopy and which is also used in two of five selected randomized controlled trials (RCTs) (Calderwood et. al., 2010). Besides, polyp detection rate is used to assess colonoscopy quality in three of five selected RCTs. A certain number of patients will be assessed by endoscopists
annually during colonoscopy to rate its quality, which number of patient will be calculated in next part. The score of BBPS for each patient will be recorded and calculated the percentage of patients who have $BBPS \geq 5$ (Appendix 7). In addition, secondary patient outcome of colonoscopy will be done by comparing the polyp detection rate.

Staff compliance level is another area to evaluate annually as nurse outcome. Assessing patient participation rate of home bowel preparation can reflect the staff compliance level as nurses are responsible to screen eligible patients and provide patient education. Apart from participation rate, staff morale is a main factor affecting the compliance rate. Therefore, a questionnaire (Appendix 10) is designed to assess staff satisfactory level and total time spent on patient education etc. The questionnaire will be distributed to each related ward, out-patient clinic and day center. Later, completed questionnaire will then be collected for analysis by communication team.

In terms of heath care system outcome, annual measurement of related expenditure will be done and to compare with previous practice which can ensure the cost-effectiveness of practice. On the other hand, continues monitoring of frequency and severity of related AIRS reports can help to ensure a safe practice is delivered to
To evaluate primary patient outcome, a hypothesis testing will be conducted to compare whether there is significant difference with baseline data in terms of percentage of patient with BBPS $\geq 5$, i.e. clinical threshold of good quality bowel preparation (Appendix 7). The latest available data of unsatisfactory bowel preparation is 13.8%, in turn, there are 86.2% of local patient with satisfactory results (Szeto, 2005). With reference to Tae et al. (2012), there should be about 10% improvement of BBPS $\geq 5$, that 93.1% in intervention group vs. 81.6% in control group in their study. To minimize type 1 and type 2 errors, hypothesis testing will take 5% level of significance and 80% power. Using computer software by Lenth (2006-9) and choosing “test of one proportion” with null value as 0.862 and actual value as 0.931, number of subject is calculated and which 166 patients are required. However, some patients may default the colonoscopy appointment. Based on observation, there are about 5% of attrition rate, so the number of patient required for evaluation is about 175 patients. Therefore, there are 175 patients will be selected as evaluation group by convenient sampling, that is the first 175 eligible patients in each year who are arranged with an out-patient colonoscopy appointment.
4.3.4 Method of analysis

For primary patient outcome, BBPS score will be recorded after colonoscopy. Analysis of bowel preparation quality will be done by performing a two tail z test for testing one proportion and computer programme SPSS version 22.0 will be used for data analysis. Above method of analysis will also be applied to evaluate the secondary patient outcome, i.e. polyp detection rate and to test if there is significant difference compared with previous practice.

To analyses nurse morale, results of evaluation questionnaire will be quantified and summarized by calculating its mean and standard deviation for each item. In addition, mean and standard deviation of average time of bowel preparation education will be calculated and compared with previous practice i.e. in-patient bowel preparation with nurse monitoring.

For health care system outcome, sum of out-patient colonoscopy related expenditure will be calculated annually and compared with previous practice.
4.3.5 Basis for an effective change of practice

The annual evaluation will be done by communication team, and the final report will be sent to department manager and to consider continue of new practice according to its benefits and cost-effectiveness to patients, nurses and health care system. In terms of patient outcome, the percentage of patient with BBPS $\geq 5$ should be improved and reach 93.1% with reference to Tae et. al. study in 2012. In addition, the overall polyp detection rate should also be higher as stated by Spiegel et. al. (2011), Calderwood and Jacobson (2010) and Kim et. al. (2014) that there is linear relationship between bowel preparation quality and polyp detection rate. Therefore patient bowel preparation quality and colonoscopy quality will be improved. On the other hand, new practice should be applied to at least 90% of eligible patients which can show a good compliancy rate of nurse in doing patient assessment and education. However, this new practice somehow will increase workload of ward nurses as they need to spend time on providing patient education. With aid of innovated education materials and support from trainers, their acceptance and satisfaction levels towards new practice could be positive e.g. rated about 4 in satisfaction level which equals to “quite satisfy”. Last but not least, an obvious decrease of hospital expenditure should be resulted after change of practice and the cost of new practice should be similar as estimated in previous chapter.
References


Hong Kong West Cluster. (2013). Clinical Services Plan for the Hong Kong West Cluster. Hospital Authority.


Appendix 1: Supplementary Images

結腸鏡及息肉切除術

簡介

結腸鏡是一種纖細的長管子，可以併入胃
門及大腸。醫生進行檢查前，會讓您
先喝大量的水，使腸道清空，方便結
腸鏡的檢查。檢查當天早上，要服用結
腸清潔劑，利用電動機搖動，將腸道
內的糞便清除。腸道清潔後，不會影響
您的活動，只會僅長時間的稍微不適
。

準備工作

- 飲酒及進食：您可以在門診檢查後
  即可進食。
- 護理：您需要穿著長袖上衣和長
  褲。
- 護理：檢查前一天要禁食。
- 藥物：如果有需要，請遵照醫生
  這次。

過程

- 檢查將在門診檢查後即刻進行。
- 檢查過程可能約30至45分鐘。
- 檢查後，您可能會感受到一點
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COLONOSCOPY AND POLYPECTOMY

INTRODUCTION

Colonoscopy is the procedure of viewing the
inside of the large bowel using a long flexible
colonoscope. If a small polypoid growth (up to
0.2 cm) is seen, it can be removed (polypectomy).
If the growth looks suspicious, biopsy of the growth
will be done and tissue sent for laboratory analysis.

Preparation

- A soft diet must be followed with low fibre
  for two days before the procedure.
- Fasting the night before, or on the morning of
  the procedure to empty the bowel.
- Please inform the doctor, or nurse if you
  have a history of drug sensitivity.
- A written consent is required.

Procedure

- Colonoscopy and polypectomy is usually
  performed in the Endoscopy Unit with or
  without anaesthesia.
- Your doctor will put you in a bent position
  with the thigh and leg flexed.
- The flexible colonoscope is then inserted
  into the large bowel lumen through the
  anus.
- You may feel a bit discomfort when air is
  pumped in to open up the lumen of the
  bowel for proper vision.
- This procedure may last for 1 to 2 minutes to
  one hour depending mainly on the
  anatomy of the large bowel.

Caution and Advice

- Under most situations, normal diet may
  resume after the effect of anaesthesia
  wears off. Your doctor will advise you.
- If there is abdominal pain, fever and
  massive rectal bleeding in experienced,
  immediately return to the Accident &
  Emergency Department of Hospital.

Complications

- Blood stained stool due to bleeding is
  expected in the first two days after
  polypectomy or biopsy. Bleeding will
  usually be severe.
- Blood perfusion occurred in less than
  0.1%, which may require an operation to
  repair the hole.
### Methodology Checklist 2: Controlled Trials

**SIGN**

**Study identification**  *(Include author, title, year of publication, journal title, pages)*


<table>
<thead>
<tr>
<th>Guideline topic:</th>
<th>Key Question No:</th>
<th>Reviewer:</th>
</tr>
</thead>
</table>

**Before** completing this checklist, consider:

1. Is the paper a **randomized controlled trial** or a **controlled clinical trial**? If in doubt, check the study design algorithm available from SIGN and make sure you have the correct checklist. If it is a **controlled clinical trial** questions 1.2, 1.3, and 1.4 are not relevant, and the study cannot be rated higher than 1+

2. Is the paper relevant to key question? Analyze using PICO (Patient or Population Intervention Comparison Outcome). IF NO REJECT (give reason below). IF YES complete the checklist.

**Reason for rejection:**
1. Paper not relevant to key question □
2. Other reason □

(please specify):

### SECTION 1: INTERNAL VALIDITY

#### In a well conducted RCT study…

<table>
<thead>
<tr>
<th></th>
<th>Does this study do it?</th>
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<tbody>
<tr>
<td>1.1</td>
<td>The study addresses an appropriate and clearly focused question. i</td>
</tr>
<tr>
<td>1.2</td>
<td>The assignment of subjects to treatment groups is randomised. ii</td>
</tr>
<tr>
<td>1.3</td>
<td>An adequate concealment method is used. iii</td>
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<tr>
<td>1.4</td>
<td>Subjects and investigators are kept ‘blind’ about treatment allocation.</td>
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<td>1.5</td>
<td>The treatment and control groups are similar at the start of the trial.</td>
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<tr>
<td>1.6</td>
<td>The only difference between groups is the treatment under investigation.</td>
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<td>1.7</td>
<td>All relevant outcomes are measured in a standard, valid and reliable way.</td>
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<tr>
<td>1.8</td>
<td>What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?</td>
</tr>
<tr>
<td>1.9</td>
<td>All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).</td>
</tr>
<tr>
<td>1.10</td>
<td>Where the study is carried out at more than one site, results are comparable for all sites.</td>
</tr>
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</table>

**SECTION 2: OVERALL ASSESSMENT OF THE STUDY**

<p>| 2.1 | How well was the study done to minimise bias? <em>Code as follows:</em> | High quality (++) ☑ Acceptable (+) □ Unacceptable – reject 0 □ |
| 2.2 | Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention? | No, although the sample size is large enough, there is high drop-out rate and result is analysed without intention to treat, the result also is not statistically significant. |
| 2.3 | Are the results of this study directly | No |</p>
<table>
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<th>applicable to the patient group targeted by this guideline?</th>
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<tr>
<td>2.4 Notes. Summarise the authors’ conclusions. Add any comments on your own assessment of the study, and the extent to which it answers your question and mention any areas of uncertainty raised above.</td>
<td>The authors conclude that the intervention is no effect to improve bowel preparation quality, however the results of this study is not reliable as commented above.</td>
</tr>
</tbody>
</table>
Methodology Checklist 2: Controlled Trials

Study identification  

(Include author, title, year of publication, journal title, pages)


Guideline topic: | Key Question No: | Reviewer:
--- | --- | ---

**Before** completing this checklist, consider:

3. Is the paper a **randomised controlled trial** or a **controlled clinical trial**? If in doubt, check the study design algorithm available from SIGN and make sure you have the correct checklist. If it is a **controlled clinical trial** questions 1.2, 1.3, and 1.4 are not relevant, and the study cannot be rated higher than 1+

4. Is the paper relevant to key question? Analyse using PICO (Patient or Population Intervention Comparison Outcome). IF NO REJECT (give reason below). IF YES complete the checklist.

Reason for rejection: 1. Paper not relevant to key question □ 2. Other reason □ (please specify):

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### Section 1: Internal validity

**In a well conducted RCT study…**  

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<th>Does this study do it?</th>
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<td>Yes ✓</td>
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<tr>
<th>1.1 The study addresses an appropriate and clearly focused question. xii</th>
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<td>Yes ✓</td>
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<td>Can’t say □</td>
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</table>
### Section 2: Overall Assessment of the Study

1. **How well was the study done to minimise bias?**
   - Code as follows:\textsuperscript{xxii}
     - High quality (++)
     - Acceptable (+)
     - Unacceptable – reject 0

2. **Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?**
   - No, although the result is statistically significant, there is statistically significant difference in baseline data. Also calculation of sample size was not mentioned, therefore the adequacy of sample size is unknown.

3. **Are the results of this study directly applicable to the patient group targeted by this guideline?**
   - No, need more evidence to prove the relationship between the baseline data (e.g. different educational level, previous experience of colonoscopy) and effect size of intervention.

4. **Notes.** Summarise the authors’ conclusions. Add any comments on your own assessment of the study, and the extent to which it answers your question and mention any areas of uncertainty raised above.
   - It suggested that supplemental colonoscopy instructional video is effective to improve bowel preparation and patients’ satisfaction. The authors also list out their limitation of their study i.e. single centered and single preparation study and significant difference in baseline data of patients.
   - In my opinion the significant difference in baseline data is due to poor randomization technique since randomization was done by giving a sealed envelope in numerical order after consent was obtain. Also the numbered

---

<table>
<thead>
<tr>
<th>Question</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where the study is carried out at more than one site, results are comparable for all sites. \textsuperscript{xxi}</td>
<td>Yes ☐ No ☐ Can’t say ☑ Does not apply ☐ Individual data from different center not mentioned</td>
</tr>
</tbody>
</table>

---

\textsuperscript{xxi} Reference XX
\textsuperscript{xxii} Reference XX

---

54
envelops were not given randomly and arrangement of placing intervention or control instruction material into those numbered envelopes were not mentioned.

The above concern also affect the concealment method, as it is unknown which party was responsible to make the numbered envelope and insert the instruction material into it. If it was done by the researcher, they could be able to distinguish the group assignment by remembering the numbers marked on envelopes.
Methodology Checklist 2: Controlled Trials

Study identification  (Include author, title, year of publication, journal title, pages)

<table>
<thead>
<tr>
<th>Guideline topic:</th>
<th>Key Question No:</th>
<th>Reviewer:</th>
</tr>
</thead>
</table>

**Before** completing this checklist, consider:

5. Is the paper a **randomised controlled trial** or a **controlled clinical trial**? If in doubt, check the study design algorithm available from SIGN and make sure you have the correct checklist. If it is a **controlled clinical trial** questions 1.2, 1.3, and 1.4 are not relevant, and the study cannot be rated higher than 1+

6. Is the paper relevant to key question? Analyse using PICO (Patient or Population Intervention Comparison Outcome). IF NO REJECT (give reason below). IF YES complete the checklist.

Reason for rejection: 1. Paper not relevant to key question □ 2. Other reason □ (please specify):

### Section 1: Internal validity

**In a well conducted RCT study...**

<table>
<thead>
<tr>
<th></th>
<th>Does this study do it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>The study addresses an appropriate and clearly focused question. xxiii</td>
</tr>
<tr>
<td></td>
<td>Yes □/ No □/ Can't say □</td>
</tr>
<tr>
<td>1.2</td>
<td>The assignment of subjects to treatment groups is randomised. xxiv</td>
</tr>
<tr>
<td></td>
<td>Yes □/ No □/ Can't say □</td>
</tr>
</tbody>
</table>

Envelope was not sealed for random assignment
<table>
<thead>
<tr>
<th>1.3</th>
<th>An adequate concealment method is used.\textsuperscript{xxv}</th>
<th>Yes $\square$ No $\square$ Can’t say $\square$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4</td>
<td>Subjects and investigators are kept ‘blind’ about treatment allocation.\textsuperscript{xxvi}</td>
<td>Yes $\square$ No $\square$ Can’t say Single blind</td>
</tr>
<tr>
<td>1.5</td>
<td>The treatment and control groups are similar at the start of the trial.\textsuperscript{xxvii}</td>
<td>Yes $\square$ No $\square$ Can’t say</td>
</tr>
<tr>
<td>1.6</td>
<td>The only difference between groups is the treatment under investigation.\textsuperscript{xxviii}</td>
<td>Yes $\square$ No $\square$ Can’t say</td>
</tr>
<tr>
<td>1.7</td>
<td>All relevant outcomes are measured in a standard, valid and reliable way.\textsuperscript{xxix}</td>
<td>Yes $\square$ No $\square$ Can’t say</td>
</tr>
<tr>
<td>1.8</td>
<td>What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?\textsuperscript{xxx}</td>
<td>Intervention: 12.1% Control: 12.7%</td>
</tr>
<tr>
<td>1.9</td>
<td>All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).\textsuperscript{xxx\textit{i}}</td>
<td>Yes $\square$ No $\square$ Can’t say Does not apply</td>
</tr>
<tr>
<td>1.10</td>
<td>Where the study is carried out at more than one site, results are comparable for all sites.\textsuperscript{xxxii}</td>
<td>Yes $\square$ No $\square$ Can’t say Does not apply</td>
</tr>
</tbody>
</table>

**SECTION 2: OVERALL ASSESSMENT OF THE STUDY**

<table>
<thead>
<tr>
<th>2.1</th>
<th>How well was the study done to minimise bias? Code as follows.\textsuperscript{xxx\textit{iii}}</th>
<th>High quality (++)$\square$ Acceptable (+)$\checkmark$ Unacceptable – reject 0 $\square$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2</td>
<td>Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain</td>
<td>Yes, there is enough sample size, with low drop-out rate, and no significant difference of baseline data of both group. Also measure outcome is</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>---</td>
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</tr>
<tr>
<td>2.3</td>
<td>Are the results of this study directly applicable to the patient group targeted by this guideline?</td>
<td>Yes</td>
</tr>
<tr>
<td>2.4</td>
<td><strong>Notes.</strong> Summarise the authors’ conclusions. Add any comments on your own assessment of the study, and the extent to which it answers your question and mention any areas of uncertainty raised above.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The authors concluded that the intervention can reduce anxiety before colonoscopy and improve bowel preparation results and therefore quality of colonoscopy. However the measure outcome for bowel preparation quality is based on subjective blinded evaluation of endoscopists but not measured by standard and valid tools/ scale.</td>
<td></td>
</tr>
</tbody>
</table>
### Methodology Checklist 2: Controlled Trials

**Study identification** (Include author, title, year of publication, journal title, pages)

---

**Guideline topic:**

**Key Question No:**

**Reviewer:**

---

**Before** completing this checklist, consider:

7. Is the paper a randomised controlled trial or a controlled clinical trial? If in doubt, check the study design algorithm available from SIGN and make sure you have the correct checklist. If it is a controlled clinical trial questions 1.2, 1.3, and 1.4 are not relevant, and the study cannot be rated higher than 1+

8. Is the paper relevant to key question? Analyse using PICO (Patient or Population Intervention Comparison Outcome). IF NO REJECT (give reason below). IF YES complete the checklist.

---

**Reason for rejection:**

1. Paper not relevant to key question ☐
2. Other reason ☐

(please specify):

---

**Section 1: Internal validity**

<table>
<thead>
<tr>
<th>In a well conducted RCT study...</th>
<th>Does this study do it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 The study addresses an appropriate and clearly focused question.(^{xxxiv})</td>
<td>Yes ✓ No ☐ Can’t say ☐</td>
</tr>
<tr>
<td>1.2 The assignment of subjects to treatment groups is randomised.(^{xxxv})</td>
<td>Yes ✓ No ☐ Can’t say ☐</td>
</tr>
<tr>
<td>1.3 An adequate concealment method is used.(^{xxxvi})</td>
<td>Yes ✓ No ☐ Can’t say ☐</td>
</tr>
</tbody>
</table>
1.4 Subjects and investigators are kept ‘blind’ about treatment allocation. xxxvii
   - Yes ☑ No ☐ Can’t say ☐

1.5 The treatment and control groups are similar at the start of the trial. xxxviii
   - Yes ☑ No ☐ Can’t say ☐

1.6 The only difference between groups is the treatment under investigation. xxxix
   - Yes ☑ No ☐ Can’t say ☐

1.7 All relevant outcomes are measured in a standard, valid and reliable way. xli
   - Yes ☑ No ☐ Can’t say ☐

1.8 What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed? xli
   - Experimental group: 38.9%
   - Control group: 39.1%

1.9 All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis). xlii
   - Yes ☑ No ☐ Can’t say ☐
   - Does not apply ☐

1.10 Where the study is carried out at more than one site, results are comparable for all sites. xliii
   - Yes ☐ No ☑ Can’t say ☐
   - Does not apply ☐

SECTION 2: OVERALL ASSESSMENT OF THE STUDY

2.1 How well was the study done to minimise bias? [xliiv]
   - High quality (++)
   - Acceptable (+)
   - Unacceptable – reject

2.2 Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the
   - Yes, since the study was conducted in two phases. Phase one: A cognitive interview was used to design the intervention and evaluate by conducting a pilot test before proceed to phase two: Randomized controlled
<table>
<thead>
<tr>
<th><strong>2.3</strong></th>
<th>Are the results of this study directly applicable to the patient group targeted by this guideline?</th>
<th>Yes</th>
</tr>
</thead>
</table>

**Notes.** Summarise the authors’ conclusions. Add any comments on your own assessment of the study, and the extent to which it answers your question and mention any areas of uncertainty raised above.

To conclude the study, a novel educational booklet can improve the quality of bowel preparation by fulfilling patients’ knowledge needs and correcting misconception based on health believe model.

This study can provide an evidence-based intervention in bowel preparation education for patient undergoing colonoscopy. However, the difference between methods of bowel preparation i.e. split dose, different medication used which may also affect the quality of bowel preparation did not investigated in this study. Also there is no definite relationship between quality of bowel preparation and outcome of colonoscopy i.e. polyp detection rate and tumor rate reduction that a further study may needed.
Methodology Checklist 2: Controlled Trials

Guideline topic: | Key Question No: | Reviewer:
---|---|---

**Before** completing this checklist, consider:

9. Is the paper a **randomised controlled trial** or a **controlled clinical trial**? If in doubt, check the study design algorithm available from SIGN and make sure you have the correct checklist. If it is a **controlled clinical trial** questions 1.2, 1.3, and 1.4 are not relevant, and the study cannot be rated higher than 1+.

10. Is the paper relevant to key question? Analyse using PICO (Patient or Population Intervention Comparison Outcome). IF NO REJECT (give reason below). IF YES complete the checklist.

Reason for rejection: 1. Paper not relevant to key question ☐ 2. Other reason ☐ (please specify):

### Section 1: Internal validity

**In a well conducted RCT study...**

<table>
<thead>
<tr>
<th>Key Question No:</th>
<th>Does this study do it?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.1</strong> The study addresses an appropriate and clearly focused question. [xlv]</td>
<td>Yes ☑ No ☐ Can’t say ☐</td>
</tr>
<tr>
<td><strong>1.2</strong> The assignment of subjects to treatment groups is randomised. [xlvi]</td>
<td>Yes ☑ No ☐ Can’t say ☐</td>
</tr>
<tr>
<td><strong>1.3</strong> An adequate concealment method is used. [xlvii]</td>
<td>Yes ☑ No ☐ Can’t say ☐</td>
</tr>
<tr>
<td>Q</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1.4</td>
<td>Subjects and investigators are kept ‘blind’ about treatment allocation.</td>
</tr>
<tr>
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<td>All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).</td>
</tr>
<tr>
<td>1.10</td>
<td>Where the study is carried out at more than one site, results are comparable for all sites.</td>
</tr>
</tbody>
</table>

**SECTION 2: OVERALL ASSESSMENT OF THE STUDY**

<table>
<thead>
<tr>
<th>Q</th>
<th>Description</th>
<th>High quality (++)</th>
<th>Acceptable (+)</th>
<th>Unacceptable – reject 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>How well was the study done to minimise bias? Code as follows.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td>Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?</td>
<td>Yes, the study had adequate sample size, low drop-out rate and using valid scales for outcome measurement. Also the result is statistically significant.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3</td>
<td>Are the results of this study directly</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>applicable to the patient group targeted by this guideline?</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 2.4 Notes

Summarise the authors’ conclusions. Add any comments on your own assessment of the study, and the extent to which it answers your question and mention any areas of uncertainty raised above.

The authors concluded the intervention can improve quality of bowel preparation.

In the study design, randomization was done by random-number generator, but details of how the patient divided into either intervention group or control group is not mention as well as concealment method. It could be acceptable since evaluation was done by endoscopists who were blinded to the study and there were no significant baseline different of two group of patients.
<table>
<thead>
<tr>
<th>Citations/Study Design</th>
<th>Patient characteristics</th>
<th>Intervention</th>
<th>Comparison</th>
<th>Outcome measure</th>
<th>Effect size (intervention vs control)</th>
</tr>
</thead>
</table>
| Shaikh et al. (2010) / RCT (1+) (single-center) | • Mean age 58 years  
• 42% male  
• 76% English speakers  
• No experience of colonoscopy  
• Bowel prep: not mentioned (n=121) | Educational pamphlet (English or Spanish) + control (n=51) | Bowel Prep instruction only (n=55) | (1) Bowel prep quality:  
• Subjective blinded evaluation (good-satisfactory-poor) | (1)  
Good: 66.7% vs 23.6% (P=0.0001)  
Satisfactory: 29.4% vs 9.1% (P=0.006)  
Poor: 9.8% vs 27.3% (P=0.02) |
| Calderwood et al. (2011)/ RCT (1-) (single-center) | • Mean age 73 years  
• 42% male  
• 63% native English speakers  
• 16% experience of previous colonoscopy  
• Bowel prep: | Simple visual aid (image with multiple language supplement) + control (n=477) | Standard written precolonoscopy information only (n=492) | (1) Bowel prep quality:  
• Qualitative assessment (excellent-good; fair-poor-unsatisfactory)  
• Boston Bowel Preparation Scale (0-9) ≥5 as clinical threshold (higher = better) | (1)  
Excellent-good: 82% vs 82%  
Fair-poor-unsatisfactory: 18% vs 18%  
BBPS median: 6.0 vs 6.0 (P=0.69)  
BBPS ≥5: 89% vs 91% (P=0.43) |
### Appendix 3: Table of Evidence

<table>
<thead>
<tr>
<th>Study</th>
<th>Mean age</th>
<th>Bowel Prep</th>
<th>Written bowel preparation</th>
<th>Colonoscopy quality</th>
<th>Polyp yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spiegel et al. (2011)/ RCT (1++) (single-center)</td>
<td>Mean age 60 years</td>
<td>97% male</td>
<td>English speaker</td>
<td>38% experience previous colonoscopy</td>
<td>74% magnesium citrate, 2% sodium phosphate, 24% PEG (2L)</td>
</tr>
<tr>
<td>Novel patient educational booklet (English) + control (n=132)</td>
<td>Written bowel preparation instruction and pre-procedural colonoscopy class (with video and Q&amp;A) only (n=134)</td>
<td>Ottawa Score: 4.4±2.3 vs 5.1±2.9 (P=0.03)</td>
<td>Likert Score: 4.0±1.0 vs 3.8±1.3 (P=0.04)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colonoscopy quality:</td>
<td>Polyp yield</td>
<td>Only mention there is linear and statistically sig. relationship between bowel prep Likert scores and polyp yield in previous research</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tae et al.</th>
<th>Mean age</th>
<th>Cartoon visual</th>
<th>Written</th>
<th>Bowel prep quality:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ottawa Score:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.0±1.0 vs 3.8±1.3 (P=0.04)</td>
</tr>
</tbody>
</table>
### Appendix 3: Table of Evidence

<table>
<thead>
<tr>
<th>Study (Year)/Design</th>
<th>Age (Median)</th>
<th>Gender</th>
<th>Bowel Preparation</th>
<th>Details</th>
<th>Colonoscopy Quality</th>
<th>BBPS</th>
<th>UPAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2012)/ RCT (1+) (single-center)</td>
<td>48 years</td>
<td>70% male</td>
<td>Educational instruction (Korean or English)</td>
<td></td>
<td>Boston Bowel Preparation Scale</td>
<td>BBPS median: 9.0 vs 6.0 (P≤0.01)</td>
<td>BBPS mean: 7.4±1.9 vs 6.1±2.2 (P≤0.01)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>95% native Korean speakers</td>
<td>No previous experience of colonoscopy</td>
<td>Bowel prep: split-dose PEG (3L+1L) (n=205)</td>
<td>Universal Preparation Assessment Scale (0-4; lower = better, threshold ≤1)</td>
<td>BBPS≥5: 93.1% vs 81.6% (P=0.02)</td>
<td>UPAS median: 1.0±0.0 vs 2.0±0.0 (P≤0.01)</td>
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<tr>
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<td></td>
<td>BBPS mean: 0.7±0.9 vs 1.7±0.9 (P≤0.01)</td>
<td>UPAS≤1: 85.3% vs 40.8% (P≤0.01)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>(2) Colonoscopy quality:</td>
<td>(2)</td>
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<tr>
<td></td>
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<td></td>
<td>Insertion time (min) 7.7±4.2 vs 7.1±4.4 (P=0.33)</td>
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<td></td>
<td>Withdrawal time (min) 9.0±4.8 vs 11.1±4.4</td>
<td>(P≤0.01)</td>
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<td>Workup time (min) 16.7±6.0 vs 18.3±5.6 (P=0.06)</td>
<td>53.9% vs 54.4% (P=1.00)</td>
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<td></td>
<td>Polyp detected 53.9% vs 54.4% (P=1.00)</td>
<td>53.9% vs 54.4% (P=1.00)</td>
</tr>
<tr>
<td>Prakash et al. (2013)/ RCT (1-)</td>
<td>Mean age 35 years</td>
<td>44% male</td>
<td>Online educational video instruction(English)</td>
<td>Instruction brochure only (n=66)</td>
<td>Bowel prep quality:</td>
<td>Ottawa Scale Median (IQR):</td>
<td>1.00 (1-4) vs 5.00 (3-7)</td>
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<tr>
<td>(multi-center)</td>
<td>● English speaker</td>
<td>+ control (n=67)</td>
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<td>● 47% experience</td>
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<td>of colonoscopy</td>
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<tr>
<td></td>
<td>● Bowel prep:</td>
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<td></td>
<td>split-dose of</td>
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<tr>
<td></td>
<td>sodium sulfate,</td>
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<td></td>
<td>potassium sulfate</td>
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<tr>
<td></td>
<td>and magnesium</td>
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<tr>
<td></td>
<td>sulfate solution</td>
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</tr>
<tr>
<td></td>
<td>(n=147)</td>
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</tr>
</tbody>
</table>

(2) Colonoscopy quality:
not measured

(P=0.0002)
Appendix 4

Evidence-based Practice Guideline

On the Use of Supplementary Educational Materials to Enhance Adherence to Home Bowel Preparation in Adults undergoing Colonoscopy

Introduction:

Current practice of bowel preparation for out-patient colonoscopy under nurse supervision causes burden of workload and wastage of resources. According to latest evidence, a supplementary educational material can assist patient self-monitoring of their bowel preparation process and shift the bowel preparation procedure into home-based. It is more cost-effective and improves the arrangement of colonoscopy by shorten the waiting time and promote patient’s satisfaction.

Objectives:

5. To summarize evidence of effective patient educational interventions to improve patients’ adherence to bowel preparation instructions.

6. To tailor-made an evidence-based patient educational material for target patients in local setting according to the recommendations from evidence
7. To formulate a patient selection criteria to differentiate eligible patients for the evidence-based practice

Target group:

Adult patients preparing for colonoscopy

- Adult patients from medical and surgical departments arranged with out-patient colonoscopy

Recommendation 1:

Content of educational material should include details of colonoscopy and steps of bowel preparation with images as reference.

(Grade of recommendation: A)

According to Health belief model, when patient received adequate health knowledge related to colonoscopy and importance of bowel cleanliness, their anxiety will be reduced and willing to comply with the bowel preparation instruction (Spiegel et al., 2011: 1++; Shaikh et al., 2010: 1+). Furthermore, with supplement of visual aid, e.g. images, cartoons, can facilitate patient’s understanding and follow the instructions (Tae et al., 2012: 1+; Shaikh et al., 2010: 1+).
Recommendation 2:

All adult patients aged 18 or above who are able to read and understand written Chinese and English are eligible to use the educational material.

(Grade of recommendation: A)

In study done by Tae et al. (2012:1+) older age is significantly associated with poor bowel preparation results. By using of educational materials, it can help to improve their compliance and hence the bowel preparation quality (Spiegel et al., 2011: 1++; Tae et al., 2012: 1+). In addition basic requirement of patient for their study are those who can speak and read their local language, therefore our target audients should be Cantonese or English speaker and understand written Chinese or English (Spiegel et al., 2011: 1++; Tae et al., 2012: 1+).

Recommendation 3:

Educational material can be given to patient together with colonoscopy appointment slip even if it is arranged six to eight week later.

(Grade of recommendation: B)

Patients can review the educational material before colonoscopy appointment and
perform home bowel preparation according to the instructions listed. In Prakash et al. (2013: 1-), suggested as early as eight weeks before; which Shaikh et al. (2010: 1+) study, it was given at least three weeks before and Spiegel et al. (2011: 1++) was one week before.

Reference:


Tae, J. W., Lee, J.C., Hong, S.J., Han, J.P., Lee, Y.H., Chung, J.H., Yoon, H.G., Ko,

*Gastrointestinal Endoscopy.* 76(4), P.804-811
Appendix 5

Annually Material Cost of Current Practice

Assumptions:

- 2600 patients per year
- Average hourly pay of registered nurse in day time: $157/hour
- Average using of toilet and flushing: 6 times/patients
  - 0.006 m³ per flush
  - Sewage charge $2.24 per m³
- Average drinking needed for preparing bowel preparation medication: 3 Liters/patients
  - 3 Liters = 0.003 m³
  - Water supply $4.58 per m³
<table>
<thead>
<tr>
<th>Item</th>
<th>Calculation</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sewage</td>
<td>$0.006 \text{ m}^3/\text{flush} \times 6 \times 2.24/\text{ m}^3 \times 2600 \text{ patients}$</td>
<td>$209</td>
</tr>
<tr>
<td>Drinking water</td>
<td>$0.003 \text{ m}^3 \times 4.58/\text{ m}^3 \times 2600 \text{ patients}$</td>
<td>$35.7</td>
</tr>
<tr>
<td>Replacement of jars and sticks</td>
<td>by estimation</td>
<td>$30</td>
</tr>
<tr>
<td>Diet instruction sheet (A4, single side, black and write)</td>
<td>$0.1 \times 3000 \text{ copies}$</td>
<td>$300</td>
</tr>
<tr>
<td>RN monitor patient bowel preparation progress (5 hours each patient)</td>
<td>$157/\text{hr} \times 5\text{hr} \times 2600 \text{ patients}$</td>
<td>$204,1000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$204,1574.7</td>
</tr>
</tbody>
</table>
Appendix 6

Material Cost versus Annually Operational Cost of Using Evidence-based Educational Material for Home Bowel Preparation

Assumptions:

- 2000 eligible patients per year
- Patient education using educational leaflet: 3 minutes per patient (0.05 hour)
- Average hourly pay of Advance Practice Nurse/ Nurse Officer: $248/hour
- Average hourly pay of Registered Nurse in day time: $157/hour
- Total 60 RN serving related departments
### Material cost

<table>
<thead>
<tr>
<th>Items</th>
<th>Calculation</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project manager (RN)</td>
<td>$157/hr x 40hr</td>
<td>$6280</td>
</tr>
<tr>
<td>Design of leaflet (1 week)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training to APN/NO on duty (6 sites)</td>
<td>$157/hr x 0.5hr x 6 APN/NO</td>
<td>$471</td>
</tr>
<tr>
<td>Training to RN (by APN/NO at 6 sites)</td>
<td>$248/hr x 0.5hr x 60 RN</td>
<td>$7440</td>
</tr>
<tr>
<td>Printing educational leaflet (A4, double side, color)</td>
<td>3000 copies</td>
<td>$710</td>
</tr>
<tr>
<td>Printing Protocols (A4, double side, black and white)</td>
<td>$0.2 x 6 copies</td>
<td>$1.2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$14902.2</td>
</tr>
</tbody>
</table>

### Operational cost

<table>
<thead>
<tr>
<th>Items</th>
<th>Calculation</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient education by RN</td>
<td>$157/hr x 0.05 hr x 2000 patients</td>
<td>$15700</td>
</tr>
<tr>
<td>Training new RN (15 nurses/year)</td>
<td>$157/hr x 0.5 hr x 15 RN</td>
<td>$1177.5</td>
</tr>
<tr>
<td>Reprint educational leaflet (begin in 2nd year)</td>
<td>2000 copies</td>
<td>$560</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$17437.5</td>
</tr>
</tbody>
</table>


Appendix 7

Boston Bowel Preparation Scale

Definition:

Boston Bowel Preparation Scale (BBPS) is designed to evaluate bowel cleanliness which is a validated measuring tool for colonoscopy-oriented research. Score of bowel cleanliness depends on degree of bowel visualization. BBPS is composed of three parts which is to evaluate each segment of colon i.e. right colon (cecum and ascending colon), transverse colon (including hepatic and splenic flexures) and left colon (descending colon, sigmoid and rectum), and the total score will be calculated by summation.

The score of each segment rated from 0-3, as listed below:

0= mucosa not visualized with solid stool

1= a part of mucosa visualized with staining or residual stool

2= mucosa visualized but still have small amount of residual stool

3= mucosa fully visualized without any stool

Clinical threshold:
From Lai et al. (2009) study (as cited in Tae et al., 2012) BBPS \( \geq 5 \) indicates a good bowel preparation. In turn, from study by Calderwood and Jacobson (2010) also found that there is impossible to detect a polyp \( \geq 5 \text{mm} \) when BBPS is 4 or lower and a repeat colonoscopy is required.

Online instructional video for BBPS training is available at


Reference:


Appendix 8

Polyp Detection Rate

Definition:

Polyp detection rate is calculated by endoscopist to evaluate percentage of detection/and removal of colonic polyp by performing colonoscopies. It is useful to evaluate the colonoscopy quality as colonoscopy is aimed for diagnosis and early treatment of colorectal cancer by detection and removal of adenomatous polyps (Boroff et. al., 2013).

Correlations with BBPS score:

From both study from Calderwood and Jacobson (2010) and Kim et. al. (2014), concluded that there is positive relationship between BBPS score and polyp detection rate, i.e. higher BBPS score, better (higher) of polyp detection rate. However, when focus on individual BBPS segment scores, Calderwood and Jacobson (2010) found significant correlation of BBPS and polyp detection rate in left and right colon, no association was found in transverse colon. Kim et. al. (2014) also have similar finding that only BBPS score of right colon significantly associated with polyp detection rate.
Reference:


Appendix 9
Patient Evaluation Questionnaire of Home Bowel Preparation Experience for Out-patient Colonoscopy (For Pilot Study)

Date: _____________       Gender: M/F       Age: _____________

Do you have confidence to follow all bowel preparation instructions?
☐ Not confident at all ☐ A little bit confident ☐ Quite confident ☐ Very confident

Do you satisfy with your home bowel preparation experience?
☐ Not satisfy ☐ A little bit satisfy ☐ Quite satisfy ☐ Very satisfy

Do you have any previous in-patient bowel preparation experience?
☐ Yes ☐ No

- If yes, what mode of bowel preparation do you prefer?
  ☐ Home bowel preparation ☐ In-patient bowel preparation

Any comments?
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
Appendix 10
Staff Evaluation Form for Home Bowel Preparation Education Protocol

Ward/ Clinic: ______________    Date:______________

1. How much time did you spend on giving home bowel preparation education for each patient?
   ______ minutes (average)

2. Do you think patient education on home bowel preparation is difficult?
   □ Very difficult □ Quite difficult □ Neutral □ Quite easy □ Very easy

3. Do you think patient selection for home bowel preparation is difficult?
   □ Very difficult □ Quite difficult □ Neutral □ Quite easy □ Very easy

4. Do you satisfy with this new practice of home bowel preparation for colonoscopy?
   (Please circle the number below)

   1       2       3       4       5
   Not satisfy   Very satisfy
Endnote for appendix 2

i Unless a clear and well defined question is specified, it will be difficult to assess how well the study has met its objectives or how relevant it is to the question you are trying to answer on the basis of its conclusions.

ii Random allocation of patients to receive one or other of the treatments under investigation, or to receive either treatment or placebo, is fundamental to this type of study.

iii Allocation concealment refers to the process used to ensure that researchers are unaware which group patients are being allocated to at the time they enter the study. Research has shown that where allocation concealment is inadequate, investigators can overestimate the effect of interventions by up to 40%.

iv Blinding refers to the process whereby people are kept unaware of which treatment an individual patient has been receiving when they are assessing the outcome for that patient. It can be carried out up to three levels. Single blinding is where patients are unaware of which treatment they are receiving. In double blind studies neither the clinician nor the patient knows which treatment is being given. In very rare cases studies may be triple blinded, where neither patients, clinicians, nor those conducting the analysis are aware of which patients received which treatment. The higher the level of blinding, the lower the risk of bias in the study.

v Patients selected for inclusion in a trial must be as similar as possible. The study should report any significant differences in the composition of the study groups in relation to gender mix, age, stage of disease (if appropriate), social background, ethnic origin, or co-morbid conditions. These factors may be covered by inclusion and exclusion criteria, rather than being reported directly. Failure to address this question, or the use of inappropriate groups, should lead to the study being downgraded.

vi If some patients received additional treatment, even if of a minor nature or consisting of advice and counselling rather than a physical intervention, this treatment is a potential confounding factor that may invalidate the results. If groups were not treated equally, the study should be rejected unless no other evidence is available. If the study is used as evidence it should be treated with caution.

vii The primary outcome measures used should be clearly stated in the study. If the outcome measures are not stated, or the study bases its main conclusions on secondary outcomes, the study should be rejected. Where outcome measures require any degree of
subjectivity, some evidence should be provided that the measures used are reliable and have been validated prior to their use in the study.

viii The number of patients that drop out of a study should give concern if the number is very high. Conventionally, a 20% drop out rate is regarded as acceptable, but this may vary. Some regard should be paid to why patients dropped out, as well as how many. It should be noted that the drop out rate may be expected to be higher in studies conducted over a long period of time. A higher drop out rate will normally lead to downgrading, rather than rejection of a study.

ix In practice, it is rarely the case that all patients allocated to the intervention group receive the intervention throughout the trial, or that all those in the comparison group do not. Patients may refuse treatment, or contra-indications arise that lead them to be switched to the other group. If the comparability of groups through randomisation is to be maintained, however, patient outcomes must be analysed according to the group to which they were originally allocated irrespective of the treatment they actually received. (This is known as intention to treat analysis.) If it is clear that analysis was not on an intention to treat basis, the study may be rejected. If there is little other evidence available, the study may be included but should be evaluated as if it were a non-randomised cohort study.

x In multi-site studies, confidence in the results should be increased if it can be shown that similar results were obtained at the different participating centres.

x Rate the overall methodological quality of the study, using the following as a guide: High quality (++): Majority of criteria met. Little or no risk of bias. Results unlikely to be changed by further research. Acceptable (+): Most criteria met. Some flaws in the study with an associated risk of bias. Conclusions may change in the light of further studies. Low quality (0): Either most criteria not met, or significant flaws relating to key aspects of study design. Conclusions likely to change in the light of further studies.

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