


Dedicated staff for patient education improves bowel preparation quality and reduces the cecal intubation time of colonoscopy

A single institution retrospective study

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Abstract

Adequate bowel preparation is an essential part of a high-quality colonoscopy. Recent studies showed that the small-volume bowel cleansing agent Bowklean performs better in terms of tolerability and acceptability. However, its split-dose regimen is sometimes confusing to the patient. To promote Bowklean in Fu Jen Catholic University Hospital, dedicated staff for patient education on bowel preparation were provided by Universal Integrated Corporation (Taiwan), but not in every period because of the clinic room availability and manpower capacity. This provided us an opportunity to compare the quality of colonoscopy between those with and without the dedicated patient education. This study aimed to compare various quality indices between the two groups. We set bowel preparation quality as the primary endpoint, assessed by modified Aronchick scale, and other quality indices including procedure time and adenoma detection rate as the secondary endpoints. We performed a single institution retrospective study. All patients who received colonoscopy from an outpatient setting with Bowklean as the bowel cleansing agent from October 2020 to November 2020 were reviewed. Primary and secondary endpoints were then compared between the conventional group and the dedicated staff group, with StataSE 14 by Wilcoxon rank sum test or logistic regression. Four hundred ten patients were recruited, including 217 patients with dedicated patient education and 193 without. The proportion of bowel preparation quality “Excellent + Good + Fair” was significantly higher in dedicated staff group than conventional group (97.7% vs 93.3%, $P = .03$; logistic regression coefficient = 1.12). The cecal intubation time was significantly shorter in the dedicated staff group (3.68 ± 2.02 minutes vs 4.52 ± 3.25 minutes, $P < .01$). After excluding those with polypectomy or biopsy, the total procedure time tended to be shorter in the dedicated staff group (10.2 ± 3.35 minutes vs 9.40 ± 2.43 minutes, $P = .06$). There was no significant difference regarding adenoma detection rate between the two groups. Our study shows that patient education by dedicated staff can improve bowel preparation quality and has the potential to decrease procedure time. Further large-scale prospective trials are still needed to evaluate if it can also achieve a better adenoma detection rate.

Abbreviations: ADR = adenoma detection rate, CRC = colorectal cancer, FJUH = Fu Jen Catholic University Hospital.

Keywords: colonoscopy, quality improvement

1. Introduction

Colorectal cancer (CRC) is the leading cause of death worldwide.^[1] Colonoscopy played an important role in the CRC screening program and was proved to decrease the incidence

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The data that support the findings of this study are available from a third party, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are available from the authors upon reasonable request and with permission of the third party.

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and mortality of CRC.^[2] Adequate bowel preparation improves the detection of colorectal lesions and is essential for successful colonoscopy screening.^[3] Nevertheless, nearly one-quarter of colonoscopies are associated with inadequate bowel preparation.^[4] Recent research and previous studies indicated that a split-dose regimen with smaller volumes and a more pleasant taste provided a more tolerable experience, and hence significantly improved the efficacy of bowel cleansing.^[5] Currently, there are several high-quality formulas available, including Bowklean (sodium picosulfate/magnesium citrate preparation). Bowklean was demonstrated to beat traditional large-volume formula out in terms of tolerability and acceptability.^[6] However, our clinical experience had shown that its split-dose regimen was sometimes confusing. Besides, low-residue diet is also an important part of adequate bowel preparation, but patients' compliance is variable.^[7] To promote Bowklean in Fu Jen Catholic University Hospital (FJUH), dedicated staff for patient education on bowel preparation were provided by Universal Integrated Corporation (Taiwan), but not in every period because of the clinic room availability and manpower capacity. This provided us an opportunity to compare the quality of colonoscopy between those with and without the dedicated patient education. Routine instruction on how to perform bowel preparation was performed by the doctor and nurse, with a two-page diagrammatic leaflet about the detailed procedure of bowel preparation including the restriction of low-residue diet and how to use bowel-cleansing agents, for an average of

Table 1

Comparison of the patient education between conventional group and dedicated staff group.

		Conventional group	Dedicated staff group
The health staff		Doctor and nurse	A dedicated staff provided by Universal Integrated Corporation, Taiwan
Equipment	Two-page diagrammatic leaflets about the restriction of low-residue diet and how to use bowel-cleansing agents. A one-page diagrammatic leaflet describing how the stool looks like under good/poor bowel preparation	Yes No	Yes Yes
Consuming time		3–5 min	5–10 min

Table 2

Modified Aronchick scale.

Score	Description
Excellent	Small volume of clear liquid, or greater than 95% of surface seen
Good	Large volume of clear liquid covering 5–25% of the surface but greater than 90% of surface seen
Fair	Presence of some semi-solid stool that could be suctioned or washed away but greater than 90% of surface seen
Poor	Semi-solid stool that could not be suctioned or washed away and less than 90% of surface seen

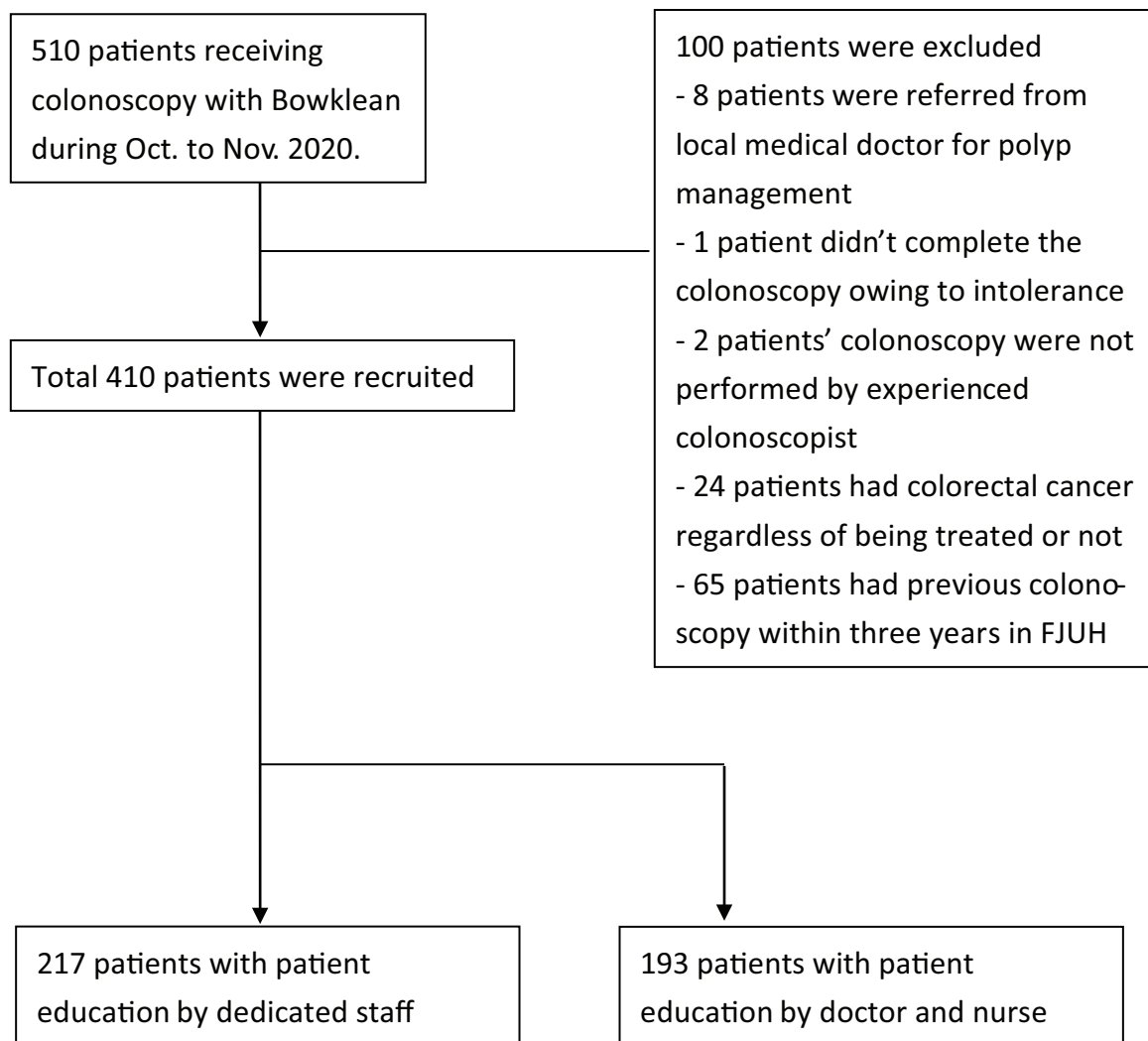


Figure 1. The flowchart of patient recruitment.

Table 3
Basic characteristics.

	Conventional group (n = 193)	Dedicated staff group (n = 217)	P*
Age (yrs), mean ± SD	48.3 ± 13.8	53.6 ± 14.0	<.01
Male, n (%)	109 (52.3)	109 (50.2)	.67
Intravenous anesthesia, n (%)	123 (63.7)	142 (65.4)	.72
Performed by operator with experience > 5 years, n (%)	102 (52.8)	86 (39.6)	<.01

*Statistics by Wilcoxon rank sum test (age)/Chi-squared test (gender, intravenous anesthesia or not, and colonoscopists' experience).

3 to 5 minutes. Patient education by the dedicated staff took an average of five to ten minutes with the same two-page leaflet plus an extra one-page diagrammatic leaflet describing how the stool looks like under good/poor bowel preparation (Table 1). This study aimed to compare various quality indices between the two groups, including bowel preparation quality, procedure time, and adenoma detection rate (ADR).

2. Materials and Methods

2.1. Subjects

Patients who received colonoscopy from an outpatient setting with Bowklean as the bowel cleansing agent were recruited retrospectively and consecutively through the database of the endoscopy department of FJUH. Patients who had the previous colonoscopy within 3 years in FJUH, were referred from other medical facilities for polyp management, had not completed the procedure for any reason, or had colorectal cancer regardless of being treated or not were all excluded. Besides, colonoscopies that were not performed by an experienced colonoscopist (here defined as having done over two-hundred fifty cases and having at least one year of colonoscopy experience) were also excluded from this study.

2.2. Outcomes

The bowel preparation quality was assessed by the examiner based on modified Aronchick scale (Table 2).^[8,9] We defined bowel preparation quality as “good preparation” if it corresponded to modified Aronchick scale “Excellent” or “Good”. We also defined the quality as “adequate preparation” if it corresponded to “Excellent”, “Good”, or “Fair”. The primary endpoint is the ratio of “good preparation” and “Adequate preparation”.

Other indices for colonoscopy quality such as procedure time (including insertion time, withdrawal time, and total procedure time), and ADR served as the secondary endpoints. As for ADR, we also performed subgroup analysis in patients with positive

fecal immunochemical test, considering that ADR is an exceptionally important quality index in the specific subgroup, with a higher request of ADR than screening colonoscopy by the most recent guideline.^[10]

2.3. Sample size calculation

We calculated the sample size based on the primary endpoint – the bowel preparation quality and referred to previous studies. According to WF Hsu et al who divided patients into two groups assigned to either a standard or modified bowel preparation protocol, the percentage of participants with excellent bowel preparation quality was 35.9% for the study group and 21.8% for the control group ($P = .002$).^[11] Based on this data, the estimated sample size by StataSE 14 for two-sample proportions test with a power of 0.8 is 322 (161 in each group). On the other hand, the study by L Elvas et al showed that the rate of adequate bowel preparation of patients with and without personalized instructions was 62% and 35%, respectively.^[12] The sample size based on this data is 106 (53 in each group) under the same condition. The number of patients receiving colonoscopy from an outpatient setting with Bowklean was estimated to be 250 per month. Based on above information, we decided to collect two-month data as a result.

2.4. Statistical analysis

Basic characteristics, bowel preparation quality, procedure time, and ADR were compared between the conventional group and dedicated staff group, with StataSE 14 by Wilcoxon rank sum test, Chi-squared test, or logistic regression. A P -value less than .05 was deemed as statistically significant.

2.5. Ethical consideration

Our study was approved by the institutional ethics committee of our hospital (FJUH-IRB number: FJUH110127). There was no financial support for this study.

3. Results

Five hundred ten patients receiving colonoscopy with Bowklean were found from October to November 2020. Hundred patients were excluded based on the criteria mentioned above. A total of 410 patients were recruited, including 217 patients with dedicated patient education and 193 without (Fig. 1, Table 3).

We analyzed the ratio of good preparation with logistic regression, and there was no significant difference between the conventional group and the dedicated staff group. On the other hand, there was a significant difference regarding the ratio of

Table 4
Comparison of bowel preparation quality, procedure time, and adenoma detection rate between conventional group and dedicated staff group.

		Conventional group (n = 193)	Dedicated staff group (n = 217)	P*
Colon preparation quality†	Good preparation, n (%)	140 (72.5%)	156 (71.9%)	0.88
	Adequate preparation, n (%)	180 (93.3%)	212 (97.7%)	0.03
Procedure time	Cecal intubation time (min), mean ± SD	4.52 ± 3.25	3.68 ± 2.02	< 0.01
	Withdrawal time‡ (min), mean ± SD	5.90 ± 1.58	5.82 ± 1.60	0.38
	Total procedure time‡ (min), mean ± SD	10.2 ± 3.35	9.40 ± 2.43	0.06
Adenoma detection, n (%)	All patients	49 (25.4%)	61 (28.1%)	0.53
	FIT(+) [§]		12 (38.7%)	12 (37.5%)

FIT = fecal immunochemical test.

*Statistics by Wilcoxon rank sum test (procedure time)/logistic regression (colon preparation quality, adenoma detection rate).

†“Good preparation” was defined as modified Aronchick scale “Excellent” or “Good”. “Adequate preparation” was defined as modified Aronchick scale “Excellent”, “Good”, or “Fair”.

‡For withdrawal time and total procedure time, only those without polypectomy or biopsy were recruited (n = 126/129, respectively).

§The number of patients with positive FIT was 31/32 in the two groups, respectively.

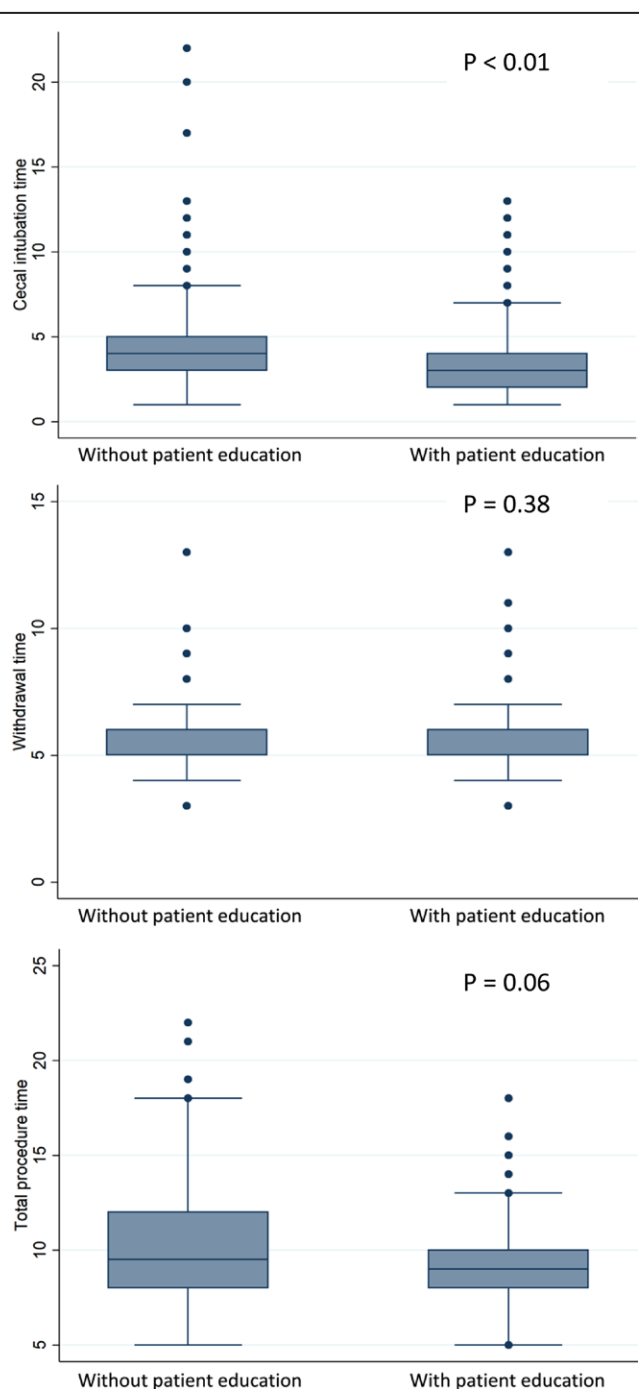


Figure 2. The box plot on cecal intubation time, withdrawal time, and total procedure time between conventional group and dedicated staff group.

adequate preparation, which accounted for 93.3% (180 in 193) in the conventional group and 97.7% (212 in 217) in the dedicated staff group ($P = .03$; coefficient = 1.12) (Table 3). We also treated these data as ordinal ones (excellent = 4, Good = 3, and so on) and analyzed them with Wilcoxon rank sum test, while there was no significance ($P = .65$; not shown in the table).

Regarding procedure time, cecal intubation time was significantly shorter in the dedicated staff group (3.68 ± 2.02 minutes vs 4.52 ± 3.25 minutes, $P < 0.01$) (Table 4, Fig. 2); the difference remained significant after excluding patients with the longest three in each group (3.56 ± 1.77 minutes vs 4.27 ± 2.64 minutes, $P < .01$; not shown in the table). As for the withdrawal time and total procedure time, there was no significant difference between the two groups (withdrawal time: 8.11 ± 4.86

minutes vs 8.37 ± 5.75 minutes, $P = .95$; total procedure time: 12.63 ± 6.48 minutes vs 12.05 ± 6.17 minutes, $P = 0.28$; not shown in the table). Because great variability existed regarding the degree of difficulty and time of polyp management, the two indices were analyzed again after excluding those with polypectomy or biopsy. One hundred twenty six in the conventional group and 129 in the dedicated staff group were left. Still, no significant difference was noted in withdrawal time (5.90 ± 1.58 minutes vs 5.82 ± 1.60 minutes, $P = .38$), while the total procedure time tended to be shorter in the dedicated staff group (10.2 ± 3.35 minutes vs 9.40 ± 2.43 minutes, $P = .06$) (Table 4, Fig. 2).

ADR was calculated after correlation with pathology report, while no significant difference was noted in the two groups (49 adenoma detection in 193 vs 61 adenoma detection in 217, $P = .53$). The same statistical analysis was done in those with positive fecal immunochemical test, and there was still no significant difference (12 in 32 vs 12 in 31, $P = .92$).

4. Discussion and Conclusions

Adequate bowel preparation is one of the most important quality indicators of screening colonoscopy, which is vital for complete mucosal inspection.^[13] Poor colon preparation decreases ADR significantly, and the screening colonoscopy is suggested to be repeated under the condition of inadequate bowel preparation.^[14] Bowel-cleansing formulas play an important role in bowel preparation, and recent studies indicated that split-dose formulas were superior to the traditional single-dose large-volume ones.^[5,6,15] However, the split-dose regimen is more complicated, so patient education matters. The importance of patient education as an essential part of successful bowel preparation had been addressed in previous studies. Questionnaire after regular instructions, dietician-designed recipe, cell phone message reminding, education through multimedia, and personalized patient education were reported to enhance the effect of bowel preparation and decrease the rate of poor colon preparation.^[11,12,16,17] Our study, on the other hand, showed that dedicated staff not only improved the quality but also decreased the procedure time, an issue which had not been fully investigated in previous studies. We postulated that it was because better bowel preparation quality led to decreased time consuming on fecal material cleansing. Since the shortcut of colonoscopist manpower became an issue after the implementation of mass-screening programs for colorectal cancer,^[18,19] the shortened procedure time may aid in the relief of this situation.

There were some advantages of our study compared with previous ones. First of all, the quality indicators of the conventional group were all up to standard, with the ratio of poor colon preparation below 10% and ADR higher than required by the current guideline.^[10] This fact strengthened the credibility of our conclusion, since the control group was already good enough, and the dedicated staff group performed even better. Second, it's the first study in the similar field proving that good bowel preparation has the potential to decrease procedure time. However, weakness existed in our study. Owing to its retrospective nature, there were some differences in basic characteristics between the two groups. There were no adequate data on how patients' age affects bowel preparation, and subgroup analysis showed no difference regarding bowel preparation quality and procedure time between colonoscopists with experience $>$ and ≤ 5 years ($P = .40$ for the ratio of adequate preparation and $P = .09$ for cecal intubation time, respectively). Second, the better bowel preparation quality in the study group failed to translate into better ADR in our work, as in previous studies.

In conclusion, our study shows that patient education by dedicated staff can improve bowel preparation quality and has the potential to decrease procedure time. Further large-scale prospective trials are still needed to evaluate if it can also achieve a better adenoma detection rate.

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