

Predictors of patient reluctance to wake early in the morning for bowel preparation for colonoscopy: a precolonoscopy survey in city-wide practice



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ABSTRACT

Introduction Many endoscopists do not use split-dose bowel preparation (SDBP) for morning colonoscopies. Despite SDBP being recommended practice, they believe patients will not agree to take early morning bowel preparation (BP). We assessed patients' opinions about waking early for BP.

Methods A self-administered survey was distributed between 08/2015 and 06/2016 to patients in Winnipeg, Canada when they attended an outpatient colonoscopy. Logistic regression was performed to determine predictors of reluctance to use early morning BP.

Results Of the 1336 respondents (52% female, median age 57 years), 33% had used SDBP for their current colonoscopy. Of the 1336, 49% were willing, 24% neutral, and 27% reluctant to do early morning BP. Predictors of reluctant versus willing were number of prior colonoscopies (OR 1.20; 95%CI: 1.07–1.35), female gender (OR 1.65; 95%CI: 1.19–2.29), unclear BP information (OR 1.86; 95%CI: 1.21–2.85), high BP anxiety (OR 2.02; 95%CI: 1.35–3.02), purpose of current colonoscopy being bowel symptoms (OR 1.40; 95%CI: 1.00–1.97), use of 4L of polyethylene glycol laxative (OR 1.45; 95%CI: 1.02–2.06), not having SDBP (OR 1.96; 95%CI: 1.31–2.93), and not having finished the laxative for the current colonoscopy (OR 1.66; 95%CI: 1.01–2.73). Most of the same predictors were identified when reluctance was compared to willing or neutral, and in ordinal logistic regression.

Conclusions Almost three-quarters of patients do not express reluctance to get up early for BP. Among those who are reluctant, improving BP information, allaying BP-related anxiety, and use of low volume BP may increase acceptance of SDBP.

 Supplemental material
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combined, as were reluctant and very reluctant responses. The proportion of patients willing, neutral, or reluctant to wake early in the morning for BP was described for each potential predictor in the subsequent analyses. Multivariable logistic regression analyses were performed to determine predictors of reluctance to use early morning BP. In separate logistic regression analysis models, those who were reluctant to use early morning BP were compared to people who were willing, people who were neutral, and people who were willing or neutral toward use of early morning BP.

In some analyses, the continuous anxiety scales were dichotomized. A score of 70 or more was chosen to indicate a high level of anxiety, because this score represented approximately the top quartile of the anxiety score among all patients.

Our main response variable was ordered from reluctant to neutral to willing to wake up early morning for BP. As such, in addition to ordinary logistic regression, we assessed whether our conclusions would be the same using ordinal logistic regression. These results are provided as supplementary material.

The odds from our logistic regressions were transformed into probabilities using the formula:

$$\text{Probability} = \text{Odds} / (1 + \text{Odds}) [26]$$

To visually inspect the importance of different variables in predicting the likelihood of being reluctant to undergo early morning BP, we graphed the probabilities of being reluctant, neutral, or willing to undergo BP early in the morning, given different levels of the independent variables in the ordinal logistic regression model. In total, 16 permutations of levels of the independent variables were graphed, and probabilities of being reluctant, neutral, or willing to undergo early morning BP were compared.

Ethical approval

This study was approved by the University of Manitoba Health Research Ethics Board.

Results

At two of the hospitals, the survey was distributed and collected by clinical staff and the response rate could be assessed; it was 86% at both locations. The other locations were not able to collect response rate information as staff were too busy to document the number of persons who refused to complete the surveys, but all locations indicated that the survey was well accepted. Of the 1336 respondents, 52.2% were women and the median age was 57 years (IQR 49–65). Participant ages ranged from 16 to 91 years. Just over one-quarter (26.5%) were reluctant or very reluctant to complete BP in the early morning, 24.0% were neutral, and 49.5% were willing or very willing (► **Table 1**).

Although type of BP used for the current colonoscopy was based on advice from their endoscopist, those who used SDBP (morning or afternoon) were less likely to be reluctant to do early morning BP for a subsequent colonoscopy than those who used day before BP (21.2% versus 29.5% reluctant respectively, $P < 0.001$). Furthermore, among those who used SDBP for their current colonoscopy, 33.3% thought that waking early in

the morning for BP would be difficult or very difficult, while 46.5% of those who had conducted day before BP thought that an early morning BP would be difficult or very difficult (P value for difference < 0.001).

Predictors of reluctance to wake early for bowel preparation

In a model that excluded those who were neutral toward early morning waking for BP (► **Table 2**, Model 1), the respondent characteristics associated with reluctance to wake early were female gender (OR 1.65), number of previous colonoscopies (OR 1.20 per colonoscopy), receiving unclear BP information (OR 1.86), having a BP anxiety score > 70 (OR 2.02), indication for current colonoscopy being symptoms (OR 1.40), using 4L of PEG laxative (OR 1.45), not having used SDBP for the current colonoscopy (OR 1.96), and not having finished the laxative for the current colonoscopy (OR 1.66). Reluctance increased with increasing number of prior colonoscopies; for example, a respondent who had had three previous colonoscopies was estimated to be 1.73 times more likely (95%CI 1.23–2.46) to be reluctant than willing (► **Table 2**, Model 1) to perform an early morning BP than one whose current colonoscopy was their first one. This estimate is derived by raising the OR for previous colonoscopies to the power of 3 ($1.20^3 = 1.73$). In a model comparing reluctant to neutral, the associations were similar to those found in the model described above, but less strong; that is, although the odds ratios were similar, fewer potential predictors were statistically significant (► **Table 2**, Model 2).

In ordinal logistic regression modeling (**Supplementary Table 1**, right column), both the statistically significant predictors, as well as the odds ratios, were similar to those found in the ordinary logistic regression modeling. Under numerous permutations of the different levels of the statistically significant predictors from the ordinal logistic regression model, we have displayed, in **Supplementary Fig. 1a,b**, the probability of being reluctant, neutral, or willing to undergo early morning BP, depending on the level of each of the following significant predictors from the ordinal logistic regressions: gender, clarity of BP information, having conducted a SDBP, having finished their laxative, and their BP anxiety score. As an example, under almost all permutations of the different levels of independent variables (e.g., female versus male, having received clear versus unclear bowel preparation information, having split the dose for the current colonoscopy versus having conducted a single-dose preparation, etc.), the probability of being willing to wake early for BP was higher than the probability of being reluctant, at low levels of anxiety about the bowel preparation. A notable exception was among women who received unclear BP information, had not conducted an SDBP for their current colonoscopy, and had not finished the laxative for their current colonoscopy (**Supplementary Fig. 1a**, panel 8). Among this group, even those with very low levels of anxiety had a relatively high probability of reluctance. The probability of reluctance among this group was almost the same as the probability of willingness when anxiety about the BP was near 0, and it increased to almost 75% when anxiety about the BP was near its highest possible score of 100. Other variables in **Supplemen-**

► **Table 1** Characteristics of the study respondents by proportion reluctant, neutral, and willing to do an early morning bowel preparation (%).

	Reluctant (n=354)	Neutral (n=321)	Willing (n=661)
Survey location (n = 1336)			
▪ Teaching hospital (28%)	25	25	50
▪ Other hospital (63%)	26	24	50
▪ Clinic (9%)	32	21	47
Gender (n = 1301)¹			
▪ Male (48%)	21	24	54
▪ Female (52%)	31	24	44
Age (n = 1293)			
▪ Mean age	56.7	55.8	56.0
▪ Median age	58	57	57
Education (n = 1212)			
▪ <Grade 12 (16%)	25	27	47
▪ Grade 12 (20%)	26	29	45
▪ <4 years post-HS (40%)	28	23	49
▪ 4+ years post-HS (24%)	24	20	56
Marital status (n = 1293)			
▪ Married (76%)	25	24	51
▪ Separated/divorced (10%)	31	25	44
▪ Widowed (5%)	33	19	48
▪ Single (9%)	31	26	43
How much bowel prep info received (n = 1258)			
▪ None (4%)	36	16	48
▪ Right amount (65%)	25	24	51
▪ Too little (30%)	28	26	46
▪ Too much (1%)	33	7	60
Clarity of bowel prep info (n = 1300)¹			
▪ Confusing (6%)	46	16	38
▪ Somewhat clear (12%)	33	24	43
▪ Clear (82%)	24	25	51
Split prep for current colonoscopy (n = 1304)¹			
▪ Yes (33%)	21	22	57
▪ No (67%)	30	25	45

► **Table 1** (Continuation)

	Reluctant (n=354)	Neutral (n=321)	Willing (n=661)
Anxiety scores (on scale of 0 to 100)			
Bowel prep anxiety (n = 1303) ¹			
▪ Score <70 (82%)	23	25	52
▪ Score 70+ (18%)	43	19	38
Colonoscopy procedure anxiety (n = 1302)			
▪ Score <70 (71%)	24	25	51
▪ Score 70+ (29%)	31	24	45
Colonoscopy results anxiety (n = 1301)			
▪ Score <70 (72%)	25	25	50
▪ Score 70+ (28%)	29	23	48
Purpose of colonoscopy (n = 1301)			
▪ Screening (25%)	22	25	53
▪ Surveillance (21%)	26	25	49
▪ Symptoms (54%)	29	23	48
Time of colonoscopy (n = 1331)			
▪ Before 1000 h (28%)	28	22	49
▪ 1000 to 1200 h (26%)	29	24	27
▪ Afternoon (36%)	23	26	51
Number of previous colonoscopies (n = 1322)			
▪ 0 (42%)	24	23	53
▪ 1 (25%)	27	25	48
▪ 2+ (33%)	29	25	46
Type of bowel prep (multiple responses allowed)			
▪ 4-L PEG (43%)	31	22	47
▪ Pico-Salax (55%)	23	26	51
▪ Adjunctive agent (52%)	25	23	51
▪ 2-L PEG (1%)	35	26	39
When last saw scope doctor (n = 1315)			
▪ Never (direct scope) (41%)	25	25	50
▪ ≤6 months ago (46%)	28	22	49
▪ >6 months ago (13%)	25	27	48
Finished laxative for current colonoscopy (n = 1320)			
▪ Yes – finished (87%)	25	23	51
▪ No – unfinished (13%)	34	28	38

¹ P value for group differences <0.01.

► **Table 2** Predictors of reluctance to use early morning bowel preparation – adjusted logistic regression analysis.

	Model 1: Reluctant vs. Willing (n = 772), Odds ratio (95%CI)	Model 2: Reluctant vs. Neutral (n = 515), Odds ratio (95%CI)
Demographic of respondent		
Female	1.65 (1.19 – 2.29) ²	1.46 (0.99 – 2.16)
Age, years (reference = 16 – 39 years)		
▪ 40 – 59	0.87 (0.51 – 1.49)	1.16 (0.64 – 2.11)
▪ 60 – 91	1.00 (0.57 – 1.76)	1.30 (0.69 – 2.45)
Married	1.03 (0.71 – 1.50)	0.94 (0.61 – 1.43)
Post-secondary education	0.99 (0.70 – 1.40)	1.48 (1.00 – 2.21)
Prep information received and anxiety of respondent		
Number of previous colonoscopies ³	1.20 (1.07 – 1.35) ²	1.13 (0.99 – 1.29)
Received “Right” amount of prep info	0.95 (0.67 – 1.34)	0.93 (0.62 – 1.38)
Bowel prep information was unclear ⁴	1.86 (1.21 – 2.85) ²	1.70 (1.04 – 2.77) ¹
Bowel preparation anxiety score > 70	2.02 (1.35 – 3.02) ²	2.18 (1.34 – 3.55) ²
Scope procedure anxiety score > 70	1.24 (0.85 – 1.80)	1.06 (0.68 – 1.65)
Scope results anxiety score > 70	0.94 (0.65 – 1.37)	1.07 (0.69 – 1.67)
Details of respondent’s current colonoscopy		
Purpose is symptoms	1.40 (0.99 – 1.97) ¹	1.62 (1.10 – 2.38) ¹
Appointment is after 1200 h	0.90 (0.62 – 1.31)	0.72 (0.47 – 1.10)
Type of laxative is 4 L of PEG	1.45 (1.02 – 2.06) ¹	1.57 (1.03 – 2.39) ¹
Adjunctive agent in laxative	0.95 (0.68 – 1.31)	0.92 (0.63 – 1.34)
Direct to scope	0.97 (0.70 – 1.36)	0.76 (0.52 – 1.11)
No split bowel preparation	1.96 (1.31 – 2.93) ²	1.42 (0.88 – 2.27)
Did not finished laxative	1.66 (1.01 – 2.73) ¹	0.85 (0.49 – 1.47)
¹ P value < 0.05.		
² P value < 0.01.		
³ Odds ratio is per previous colonoscopy. For example, an individual with 3 previous colonoscopies is estimated to be 1.20 ³ = 1.73 times more likely than an individual with 0 previous colonoscopies to be reluctant than willing to undergo SDBP.		
⁴ This refers to people who stated that the information they received was either “somewhat clear” or “confusing”, as opposed to “clear”.		

tary Fig. 1 are also in line with results from the logistic regression. For example, all else being equal, people who received unclear BP information had a higher probability of reluctance to wake early for BP, women were more likely to be reluctant than men, and those who had not finished their laxative were more likely to be reluctant than those who had finished their laxative.

The respondent behavior that had the largest impact on reluctance to wake early for BP was not having finished the laxative for their current colonoscopy (panels 2, 4, and 6 among women, and 2, 4, and 6 among men, **Supplementary Fig. 1**). Among those who did not finish their laxative, the probability of feeling reluctant approached the probability of willingness as anxiety about the BP increased, and, in some cases, the probability of feeling reluctant surpassed the probability of being willing.

Discussion

Among patients who were about to undergo a colonoscopy, approximately three-quarters were willing or neutral to wake early for BP for repeat colonoscopy. On the one hand, this indicates a significant proportion of patients who suggest that they would comply with SDBP if their endoscopists advised it. That said, one-quarter would be reluctant to conduct SDBP even if it were requested by their endoscopist; so we assessed determinants of reluctance.

In our study, there was a striking similarity in odds ratios in the model predicting reluctant versus willing to undergo early morning BP (► **Table 2**, Model 1), and that predicting reluctant versus willing or neutral (**Supplementary Table 1**, Model 3); this suggests that people who state that they are neutral toward early morning BP would likely behave similarly to those who state that they are willing to conduct an early morning BP. The predictors of reluctance were female gender, higher number of previous colonoscopies, high levels of anxiety about BP, perceived inadequacy of received BP information, the purpose of the current colonoscopy being symptoms, having used 4 L of PEG laxative for the current colonoscopy, not having split the BP for the current colonoscopy, and not having finished the laxative. Importantly, age, lower education level, presenting directly for colonoscopy without a prior visit with the endoscopist, and the timing of the current colonoscopy had no association with reluctance to wake up early for BP for a subsequent colonoscopy. An understanding of these predictors may help in developing approaches to increase the use of SDBP and the early waking that this requires of some patients.

There are a number of approaches that could be taken to reduce reluctance to wake early for BP. As suggested in previous studies [21, 27], we found that high anxiety about the BP was consistently associated with reluctance to wake early in the morning to complete BP. There has been limited research on interventions to reduce anxiety around colonoscopy. Although some randomized controlled trials suggest that providing more user friendly written materials and videos explaining how to conduct the BP appear to be effective in lowering anxiety [28 – 30], the effects have not been consistent [31], which may be related to the content of the information provided. An-

other suggestion is to allow more time with the patient before the colonoscopy [32]. More work exploring ways to mitigate anxiety may result in an increased likelihood that patients would be willing to wake early for BP.

Respondents who had undergone previous colonoscopies were more reluctant to wake early for BP for their next colonoscopy, and the reluctance increased with each prior colonoscopy. It is possible that they had not used SDBP previously and had a “successful” colonoscopy so did not feel that early morning waking for the second dose of SDBP was necessary. More widespread use of SDBP is relatively recent and people with previous colonoscopies likely used the day before method for prior colonoscopies. However, the quality of colon cleansing has not been routinely documented [33] or communicated to patients until recently and therefore it is possible that some of the patients with prior colonoscopies had inadequate prior examination leading to early repeat colonoscopy.

It is notable that 30% of respondents indicated that they did not receive enough information before the colonoscopy and a further 4% indicated that they received no information (► **Table 1**). Improved information sharing and educational resources, developed with assistance from patients experienced with colonoscopy, may help to reduce problems with instructions that are not clear to some patients. Although the amount of information received was not associated with reluctance to undergo early morning SDBP, improved messages to patients about the advantages of split dose, integrated with instructions about BP, may also decrease reluctance.

Reluctance to wake up early in the morning for BP was higher among individuals who used large volume BP laxative for a colonoscopy. One could anticipate this reluctance as it takes longer to consume large volume BP, which then would leave either shorter travel time to the endoscopy unit or the need to wake up even earlier. In this regard, the results of the recent Italian study where 38% of the study participants did not take the SDBP even though they were informed about the benefits of SDBP, likely do not apply to settings using lower volume BP [20].

The results of our study are consistent with those of randomized controlled trials, which have reported higher willingness to repeat colonoscopy with the same method among those undergoing SDBP than day before BP [17]. In our study in routine clinical practice, those who had split their bowel preparation for the current colonoscopy were more likely to be willing to undergo early morning BP for their next colonoscopy. It is possible that this is a result of selection bias—those who would be willing to undergo early morning BP in the future were also willing (and did) to undergo SDBP for their current colonoscopy. It may also suggest that the fear of the unknown may be a greater barrier to administering a morning BP than is the actual discomfort of the morning BP. An educational tool, such as a video with narratives from colonoscopy patients who had conducted SDBP and not found it too difficult, may help those who have never undergone SDBP to be comfortable with a suggestion of waking early for BP.

The documented benefits of SDBP [12–17, 19] suggest that it would be helpful to consider what administrative changes

might encourage increased use of SDBP for morning colonoscopies. One approach might be to ask at the stage of the referral whether the patient would accept a morning colonoscopy that would involve early waking to complete the BP. Our survey suggests that many people would accept this option. For some, this may even be a preferred option since early morning colonoscopies allow individuals to resume their normal diet earlier in the day. Those who indicated a preference not to have early appointments would be scheduled for later appointments. If many people chose later day appointments, there might be a longer wait for these appointments than for early in the day appointments. The offer to schedule later day appointments could be prioritized; for example, depending on the demand, it could be restricted to those advised to have frequent colonoscopies, such as those with Lynch syndrome and IBD patients with prior documented dysplasia.

Limitations and strengths

The results of this study should be considered in the context of strengths and limitations.

To ensure the survey length remained reasonable for completion, we limited the number of questions asked about waking early for a morning colonoscopy. We did not explore reasons for reluctance with direct questions, or explore options for reducing reluctance in this study. Furthermore, some respondents would have had to travel some distance to the colonoscopy location on the day of the procedure and this may have been a factor for these patients. We did not gather information about the time required to travel to the colonoscopy location. Similar to other survey studies, this study is potentially subject to socially desirable response bias and opinions may or may not reflect future behavior. Our results show associations between various patient characteristics and reluctance to conduct early morning BP, and these should be interpreted cautiously; associations differ from cause and effect. Although we know the characteristics of those who participated in this study, we do not know the characteristics of those who did not participate. We were therefore unable to assess whether those who participated differed from those who did not in a way which may have impacted the generalizability of our results.

The strengths of this study include a large and diverse sample recruited from routine city-wide clinical practices. Participants had a range of previous experience with colonoscopy and a variety of different indications for the procedure and this is typical of clinical practice. Our multiple analyses provided consistent results: in addition to the ordinary logistic regression, we assessed the assumptions for, and then conducted, an ordinal logistic regression. In both methods of logistic regression, results were nearly the same (compare ► **Table 2** with **Supplementary Table 1**), strengthening the reliability of our findings.

Conclusions

The majority of respondents to our survey indicated that they were neutral toward or willing to administer an early morning BP; however, a substantial proportion (approximately one-

quarter) would be reluctant to undertake a SDBP. As the advantages of an SDBP are strong and most patients would be willing to undertake a SDBP if asked to, endoscopists and family physicians should not hesitate to suggest splitting the dose to their patients, even if the colonoscopy will be early in the morning. It will also be important to develop strategies to improve acceptance of early morning waking for BP among those who continue to be reluctant. Addressing modifiable factors, such as improving BP information, allaying BP-related anxiety and use of low volume BP may increase acceptance of SDBP among patients and colonoscopists for early morning colonoscopies.

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Competing interests

None

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