Acceptance of colonoscopy requires more than test tolerance

Amanda Condon MD[1], Lesley Graff PhD[2], Lawrence Elliot MD[3], Alexandra Ilnyckyj MD[1]

A Condon, L Graff, L Elliot, A Ilnyckyj. Acceptance of colonoscopy requires more than test tolerance. Can J Gastroenterol 2008;22(1):41-47.

BACKGROUND: Colon cancer screening, including colonoscopy, lags behind other forms of cancer screening for participation rates. The intrinsic nature of the endoscopic procedure may be an important barrier that limits patients from finding this test acceptable and affects willingness to undergo screening. With colon cancer screening programs emerging in Canada, test characteristics and their impact on acceptance warrant consideration.

OBJECTIVES: To measure the acceptability of colonoscopy and define factors that contribute to procedural acceptability, in relation to another invasive gastrointestinal scope procedure, gastroscopy.

PATIENTS AND METHODS: Consecutive patients undergoing a colonoscopy (n=55) or a gastroscopy (n=33) were recruited. Their procedural experience was evaluated and compared pre-endoscopy, immediately before testing and postendoscopy. Questionnaires were used to capture multiple domains of the endoscopy experience and patient characteristics.

RESULTS: Patient scope groups did not differ preprocedurally for general or procedure-specific anxiety. However, the colonoscopy group did anticipate more pain. Those who had a gastroscopy demonstrated higher preprocedural acceptance than those who had a colonoscopy. The colonoscopy group had a significant decrease in scope concerns and anxiety postprocedurally. As well, they reported less pain than they anticipated. Regardless, postprocedurally, the colonoscopy group's acceptance did not increase significantly, whereas the gastroscopy group was almost unanimous in their test acceptance. The best predictor of pretest acceptability of colonoscopy was anticipated pain.

CONCLUSIONS: The findings indicate that concerns that relate specifically to colonoscopy, including anticipated pain, influence acceptability of the procedure. However, the experience of a colonoscopy does not lead to improved test acceptance, despite decreases in procedural anxiety and pain. Patients' preprocedural views of the test are most important and should be addressed directly to potentially improve participation in colonoscopy.

Key Words: *Acceptance; Colonoscopy; Test tolerance*

Il faut plus que tolérer la colonoscopie pour l'accepter

HISTORIQUE : Sur le plan des taux de participation, le dépistage du cancer du côlon, y compris par colonoscopie, tire de l'arrière par rapport aux autres examens diagnostiques. La nature intrinsèque de l'intervention endoscopique pourrait en soi nuire beaucoup à son acceptation de la part des patients et affecter la volonté de ces derniers de s'y soumettre. Compte tenu de l'avènement de nouveaux programmes de dépistage du cancer du côlon au Canada, les caractéristiques des tests et leur impact sur leur acceptabilité méritent que l'on s'y attarde.

OBJECTIFS : Mesurer l'acceptabilité de la colonoscopie et définir les facteurs qui y contribuent, par comparaison avec une autre intervention endoscopique effractive des voies digestives, la gastroscopie.

PATIENTS ET MÉTHODES : Quatre-vingt-huit patients consécutifs devant subir une colonoscopie (n = 55) ou une gastroscopie (n = 33) ont été recrutés. Leur expérience vis-à-vis de l'intervention a été évaluée en période pré-endoscopique, immédiatement avant l'intervention, puis après l'endoscopie. Des questionnaires ont été utilisés pour refléter les multiples aspects de l'expérience endoscopique et les caractéristiques des patients.

RÉSULTATS : Les différents groupes de patients soumis aux endoscopies ne présentaient pas de différences avant l'intervention pour ce qui est de l'anxiété générale ou de l'anxiété liée à l'intervention. Par contre, le groupe qui devait subir la colonoscopie anticipait plus de douleur. Ceux qui ont subi la gastroscopie ont mieux accepté l'intervention que ceux qui subissaient la colonoscopie. Après l'intervention, les sujets qui ont subi une colonoscopie ont présenté une diminution significative de leur taux d'anxiété et d'inquiétude relativement à l'examen. De même, ils ont déclaré avoir éprouvé moins de douleur que prévu. Néanmoins, après l'intervention, l'acceptation de la colonoscopie dans ce groupe n'a pas semblé augmenter significativement, tandis que le groupe soumis à la gastroscopie a fait état d'une acceptation quasi-unanime du test. Le meilleur prédicteur prétest de l'acceptabilité de la colonoscopie était la douleur anticipée.

CONCLUSIONS : Selon les résultats, les inquiétudes ayant trait spécifiquement à la colonoscopie, y compris la douleur anticipée, influent sur l'acceptabilité de l'intervention. Par contre, l'expérience de l'endoscopie n'a pas amélioré l'acceptabilité du test, malgré les baisses des taux d'anxiété et de douleur qui y étaient reliées. Les perceptions des patients avant l'intervention sont les plus importantes et il faut s'y attaquer directement si l'on veut améliorer la participation à la colonoscopie.

Colon cancer is the second leading cause of cancer death in North America. Screening has demonstrated a reduction in mortality (1). The American Gastroenterological Association endorses screening colonoscopy for average-risk, asymptomatic individuals starting at age 50 years (2). In Canada, several provinces are examining the feasibility of establishing colon cancer screening programs, including colonoscopy as a primary screening modality.

The American experience has demonstrated that there are barriers to screening colonoscopy. The National Health Interview Survey for the decade between 1987 and 1998 revealed that, within the target age group, only 29% and 34% of women and men, respectively, participated in any form of colon cancer screening. Comparatively, participation in breast or cervical cancer screening demonstrated tremendous growth, approaching 75% and 80%, respectively, during the same

[1]*Section of Gastroenterology, St Boniface General Hospital;* [2]*Department of Clinical Health Psychology;* [3]*Department of Community Health Sciences and Internal Medicine, Section of Gastroenterology, University of Manitoba, Winnipeg, Manitoba*

Correspondence: Dr Alexandra Ilnyckyj, St Boniface General Hospital, 409 Taché Avenue, Winnipeg, Manitoba R2H 2A6. Telephone 204-237-2796, fax 204-233-7154, e-mail ailnycky@sbgh.mb.ca

Received for publication May 4, 2007. Accepted June 25, 2007

decade (3). More recent data reiterate these findings; overall, only 34% of the eligible American population is compliant with any method of colon cancer screening within appropriately recommended time frames (4).

In exploring test noncompliance, research has emphasized the importance of patient, physician and system features. Disparity in participation rates has been demonstrated to relate to patient demographic factors such as sex and ethnic background (5-8). The primary care provider has been shown to have an influential role in promoting screening behaviour (4,9-11), and systemic barriers, such as payment for the test or available specialists, have been cited as contributing to less than optimal screening rates (12-14). Despite recognition of these factors and attempts to address them (15,16), screening rates continue to be low (17,18).

The nature of a colonoscopy itself may also contribute to the low screening participation rates. One study (19) examining quality of life and colorectal cancer screening found that 25% of patients were willing to surrender six months of their life to avoid the screening procedure. In another study (20), family physicians were asked to explain their understanding of patient refusal for colon cancer screening. They identified procedural pain and the intimate nature of the testing as important factors in patient noncompliance.

There are abundant data focusing on the importance of procedural sedation to help patients better tolerate the procedure (21-28). Nevertheless, this does not change the intrinsic nature of the procedure and may not change a patient's preprocedural perceptions and acceptance of the test. Research that distinguishes the concept of procedural acceptance from procedural tolerance is more limited (20,29-33) but may provide insight into, and ultimately allow us to provide an intervention for, those who are not willing to participate in colon cancer screening.

The objectives of the present study were to measure patient acceptance of colonoscopies and to define the factors that contribute to test acceptability. Acceptance was defined a priori, assessed in a clinical population undergoing the procedure and compared with the acceptance of another endoscopic procedure (gastroscopy). Patients undergoing gastroscopy were chosen as controls because the test was predicted to be highly acceptable, therefore providing an opportunity to explore factors that may contribute to differences in test acceptability.

PATIENTS AND METHODS

Process

Consecutive adult patients, referred to one of three gastroenterologists working within an ambulatory teaching clinic, who had either a colonoscopy or gastroscopy recommended by the specialist for clinical or screening purposes were eligible for the study. Emergent procedures or procedures where there was less than one week between the consultation and procedure were excluded. Patients undergoing both a gastroscopy and colonoscopy at the same time were also excluded. Informed consent was obtained by either a gastroenterology fellow or gastroenterologist who was not associated with the patient's care. Patients were provided with preprocedural information, including a pamphlet that briefly described the test and its complications.

For all endoscopy procedures, patients were prepared for the test upon arrival by the same team of endoscopy nurses in the same endoscopy suite. The nursing interaction consisted of a standardized intake assessment, intravenous insertion and review of test indication. Patients also received a brief standardized overview of their procedure. All three physicians administered conscious sedation using a combination of intravenous midazolam and/or fentanyl during the procedure.

Patient experience was measured by self-report at three points in the process: preprocedure, immediately before the procedure and postprocedure. The preprocedure questionnaire was administered one week before the procedure, and assessed beliefs regarding the endoscopy, general and health anxiety, concerns regarding outcome and anticipated pain. Patients also rated their level of acceptance of the endoscopy (preprocedural acceptance). A second questionnaire was completed while waiting for the procedure to begin, to assess the procedure preparation experience (ie, fasting or bowel emptying). The postprocedure questionnaire was completed 24 h to 72 h after the procedure to eliminate the effect of sedation. It was similar to the preprocedural questionnaire but also included questions regarding comfort of the endoscopy, postprocedure recovery and social disruption due to the procedure. Patients were again asked to rank their acceptance of the procedure (postprocedural acceptance).

Measures

There are few validated measures to assess patient experience of gastrointestinal procedures and typically, questionnaires that have been developed have a fairly narrow focus regarding satisfaction with procedural sedation and comfort. For the present study, questions were developed to assess broader patient concerns with, and experience of, the scope process from start to finish. The questions related to concerns regarding the endoscopy itself, procedure-specific anxiety, test preparation, comfort in the procedure, postprocedure recovery and acceptance of the procedure. The questions were developed based on patient reports and a literature review. Gastroenterologists who were not involved in the study reviewed the questions. Finally, the questions were piloted with a sample of endoscopy patients and gastrointestinal nurses, to assess comprehension and face validity of the items.

In addition, well-validated measures of general and health anxiety were used.

Endoscopy concerns: A 14-item Endoscopy Concerns Scale was developed to assess a patient's beliefs or attitudes preprocedure regarding a scope procedure (Appendix 1). It aimed to capture embarrassment or worry experienced with endoscopic procedures, based on specific aspects of the procedure that patients have commonly reported as unpleasant. Items were rated using a 10-point response format, from 'not at all' to 'extremely' distressed, with a total score ranging from 14 to 140; a higher score indicated greater distress. Items were modified, as indicated, for the type of endoscopic procedure; for example, gastroscopy patients were asked about gagging, while colonoscopy patients were asked about flatus.

Anxiety and pain: Individual differences in anxiety were assessed using the State Trait Anxiety Inventory and the Health Anxiety Questionnaire. The State Trait Anxiety Inventory is a 40-item scale in which 20 items measure current anxiety (state) and 20 items measure more enduring anxiety-proneness (trait). The items use a four-point response format ranging from 'not at all' to 'very much so'. The Health Anxiety Questionnaire is a 21-item scale that assesses degree of concern about health. It has high internal consistency (Cronbach's

alpha equal to 0.92) and has been shown to discriminate medical patients from the general public, as well as those with somatic concerns from those with generalized anxiety and panic disorder. Higher scores on each of the measures indicate higher anxiety. Trait and health anxiety were measured only once preprocedurally because they are stable characteristics and are not expected to fluctuate significantly.

Anxiety specific to the endoscopy was evaluated with single-item questions regarding worry about potential test outcomes of cancer, chronic illness and procedural complications, all based on a four-point scale ranging from 'not at all worried' to 'very worried', using a format similar to impact questions used in colorectal cancer screening trials (34). Anticipated and actual pain were assessed using a 10-point scale, ranging from 'none at all' to 'worst pain ever'. Higher scores were associated with greater pain.

Procedure preparation experience: The experience of the physical preparation for endoscopy was evaluated by five questions developed for the study regarding fatigue, interference with activities, discomfort, inconvenience and pain. Items were evaluated using a 10-point scale, ranging from 'not at all' to 'extremely'. Higher scores indicated more difficulty with the preparation.

Postprocedure experience – comfort, recovery and disruption: Single-item questions were created to assess physical discomfort during endoscopy, postprocedure discomfort during recovery and extent of social disruption due to the procedure. The items were evaluated using a 10-point scale, with higher scores indicating more difficulty with these aspects.

Acceptance of the procedure: The primary outcome measure for the study, procedure acceptance (both pre- and post-), was determined based on three behavioural questions:

1. Given the same medical circumstances, would you undergo this test again?;
2. Given the same medical circumstances, would you advise a friend to undergo this test?; and
3. In five years, if you were feeling well, would you undergo this test to screen for cancer?

Each question was assessed using a 10-point response format, anchored by 'not at all likely' to 'extremely likely', with a higher total score indicating greater acceptance.

Statistical analysis

The properties of the Endoscopy Concerns Scale were assessed using principal components analysis. Type of endoscopy, as well as pre- and postprocedure differences, was compared using χ^2 analysis, independent sample *t* tests and paired *t* tests, as appropriate. Correlations were calculated between the measures at each step of the Endoscopy Concerns Scale and the three-question scope acceptance scale, for each endoscopy patient group. Finally, stepwise linear regressions were used to assess contributions of the various aspects of the procedure to the patients' acceptance of the procedures. Conservative P values were used based on family-wise Bonferroni correction for multiple comparisons.

RESULTS

Study participants

During the duration of the study, 88 consecutive patients who met study criteria were recruited. Twelve patients did not complete all of the questionnaires and were excluded from the analysis. The final sample consisted of 76 patients, of whom 50 had a colonoscopy and 26 had a gastroscopy. Demographic information is provided in Table 1. More than two-thirds of the gastroscopy participants and more than three-quarters of the colonoscopy participants were female, with similar mean (± SD) ages of 46.38±15.40 years and 47.62±15.19 years, respectively. The majority of the patients had not had a previous endoscopy. In the colonoscopy group, the two most common test indications were inflammatory bowel disease and colon cancer screening, accounting for 72% of the procedures. In the gastroscopy group, the main indicators for testing were celiac disease and gastroesophageal reflux disease, accounting for 54% of gastroscopies.

TABLE 1
Characteristics of the colonoscopy patients and gastroscopy patients in the study

Characteristic	Colonoscopy patients (n=50)	Gastroscopy patients (n=26)
Age, mean ± SD	46.38±15.40	47.62±15.19
Sex, %		
Female	76.8	68.8
Male	23.2	31.2
Reason for endoscopy, %		
Screening	37.7	9.7
Diagnostic	62.3	90.3
Previous endoscopy, %		
Yes	42.3	37.5
No	57.7	62.5

Endoscopy Concerns Scale properties

The 14-item scale demonstrated good internal consistency, with Cronbach's alpha equal to 0.90. Item to total correlations on the scale ranged from 0.52 to 0.81. A principal components analysis, using varimax rotation, revealed four factors with eigenvalues greater than one. Together, the factors explained 72% of the variance. The strongest factor, with an eigenvalue of six and accounting for 45% of the variance, included items related to embarrassment during the procedure, such as distress about their buttocks being exposed, loss of control of gas or stool, and insertion of the endoscope.

The Endoscopy Concerns Scale correlated significantly with other measures of general and procedure-specific distress including state anxiety (r=0.54; P<0.01), worry that the test would identify cancer (r=0.41; P<0.01) or a chronic illness (r=0.38; P<0.01), and anticipated pain (r=0.54; P<0.01), suggesting convergent validity. The scale did not correlate significantly with actual discomfort in the procedure (r=0.17) or with more enduring characteristics of anxiousness or worry about health (r=0.21), providing some evidence of discriminant validity as well.

Differences in patient experience based on endoscopy type, as well as pre- versus postprocedural differences

Patient concerns and experiences were compared between the colonoscopy and gastroscopy participants, and across time from pre- to postprocedure. Table 2 summarizes the findings, which are further described below.

Endoscopy concerns: Baseline scores for endoscopy concerns

TABLE 2
Differences (pre- and postprocedure) based on endoscopy type

Measure	Colonoscopy		Gastroscopy	
	Pre-endoscopy, mean ± SD	Postendoscopy, mean ± SD	Pre-endoscopy, mean ± SD	Postendoscopy, mean ± SD
Endoscopy Concerns Scale	55.60 ± 26.96*	42.04 ± 20.56*	46.69 ± 26.60	33.36 ± 29.66
Anxiety score				
State	41.96 ± 14.00*	32.09 ± 10.69*	36.92 ± 12.26	32.18 ± 10.77
Trait	39.92 ± 10.46	NA	38.88 ± 13.22	NA
Health	18.06 ± 10.06	NA	17.81 ± 10.75	NA
Worry score				
Cancer	2.08 ± 0.88*	1.57 ± 0.50*	1.88 ± 0.88	1.80 ± 0.77
Illness	2.00 ± 0.77*	1.66 ± 0.60*†	2.16 ± 0.85	2.10 ± 0.91†
Complications	1.94 ± 0.70†	NA	1.58 ± 0.71†	NA
Anticipated pain/actual pain score	5.50 ± 2.31*†	3.15 ± 2.77*	4.24 ± 2.20†	2.15 ± 1.72
Test preparation score	27.67 ± 8.77†	NA	15.00 ± 7.49†	NA
Endoscopy discomfort score	NA	3.36 ± 3.15	NA	2.14 ± 2.20
Postendoscopy recovery score	NA	2.73 ± 2.62	NA	1.75 ± 2.07
Social disruption score	NA	5.20 ± 2.84	NA	3.62 ± 3.02
Endoscopy acceptance score	21.25 ± 7.14†	23.47 ± 7.20†	25.85 ± 5.31†	28.64 ± 2.90†
Patients who categorized endoscopy as acceptable, %	48.0	66.7†	69.2	95.5†

**P<0.02 within-group comparisons; †P<0.02 between-group comparisons. NA Not applicable for measurement at that time point*

preprocedurally were not significantly different for the gastroscopy and colonoscopy patients. The colonoscopy patients' scores decreased significantly once they had gone through the procedure (P=0.002). While the gastroscopy scores also dropped from pre- to postprocedure, the difference was not significant (P=0.15).

Anxiety and pain: There were no differences between the groups with respect to baseline trait anxiety and health anxiety scores. Also, there were no differences between the groups in state anxiety or procedure-specific anxiety before the procedure. However, colonoscopy participants anticipated a higher level of pain for their procedure than gastroscopy participants before the endoscopic procedure (P=0.025).

Colonoscopy patients reported significant decreases in both state anxiety (P<0.001) and procedure-specific anxiety (eg, concerns about cancer, P=0.002; chronic illness, P=0.005) following the procedure. They also experienced significantly less pain than they anticipated (P<0.001). Gastroscopy patients demonstrated no significant changes in anxiety or pain pre- to postprocedurally.

Procedure preparation experience: Colonoscopy patients reported significantly higher distress regarding the preparation for the procedure than the gastroscopy patients (P<0.001).

Postprocedure experience – comfort, recovery and disruption: There was no significant difference between the colonoscopy and gastroscopy groups with respect to the actual discomfort of endoscopy (P=0.12) or postprocedural recovery (P=0.14). While there was a trend for the colonoscopy group to report higher levels of disruption from the test than the gastroscopy group, the difference was not significant.

Acceptance of the procedure: Overall, fewer colonoscopy participants rated the scope as acceptable compared with the gastroscopy participants, both before and after the procedure. That is, when participants were categorized as 'acceptors' or 'nonacceptors' based on an a priori definition of scores that were seven or higher on all three acceptability questions, 48% of the colonoscopy and 69% of the gastroscopy patients rated the scope as acceptable before having the procedure. Following the procedure, the number of 'acceptors' in both procedural groups increased, with significantly more gastroscopy patients (96%) rating the procedure as acceptable than colonoscopy patients (67%; P=0.009). However, the change within the colonoscopy group, pre- to postprocedure, was not significant.

Predictors of procedure acceptance

Stepwise linear regressions (Table 3) demonstrated that a single variable (anticipated pain) was the best predictor of pretest acceptability for colonoscopy patients, accounting for 20% of the variance in this measure. It was also the strongest predictor for gastroscopy patients, explaining almost one-quarter of the variance (Table 3). Predictors of acceptability after the procedure differed between the patient groups (Table 4). For the colonoscopy patients, preprocedure acceptability and actual pain explained 41% of the variance. For the gastroscopy group, the Endoscopy Concerns Scale that was given postprocedure, was the only significant factor, accounting for 37% of the variance.

Some of the participants in the present study had previously had scopes. A post hoc analysis was performed for the colonoscopy group to determine whether the predictors of endoscopy acceptability were different for those who were endoscopy-naive versus endoscopy-experienced. For the endoscopy-naive subgroup, preprocedure acceptability and discomfort during the scope were significant predictors, explaining 27% of the variance (F=4.925, P=0.019). For those who had previously experienced colonoscopies, the Endoscopy Concerns Scale, postprocedure, was the only significant factor, accounting for 28% of the variance (F=7.625, P=0.014).

DISCUSSION

Our study examined patients undergoing endoscopic procedures to determine levels of test acceptability and to understand what

TABLE 3
Stepwise linear regression determining predictors of preprocedural acceptance of colonoscopy and gastroscopy

Endoscopy type	Procedural acceptability	P	F	Adjusted R^2
Colonoscopy	Anticipated pain	0.001	13.189	0.196
Gastroscopy	Anticipated pain	0.009	8.322	0.241

TABLE 4
Stepwise linear regression determining predictors of postprocedural acceptance of colonoscopy and gastroscopy

Endoscopy type	Postprocedural acceptability	P	F	Adjusted R^2
Colonoscopy	Actual pain experienced and preprocedural acceptability	<0.001	15.718	0.412
Gastroscopy	Endoscopy Concerns Scale, postprocedure	0.004	10.931	0.369

contributes to acceptability. As expected, the overwhelming majority of patients undergoing a gastroscopy ranked the test as acceptable. This was in stark contrast to our findings in those undergoing a colonoscopy.

Based on the study results, one cannot attribute differences in test acceptance to greater anxiety with colonoscopy. The two study groups scored similarly on both trait and state anxiety. Also, all participants acknowledged preprocedural anxiety, which diminished with the procedure. However, this did not translate to increased acceptability of colonoscopy postprocedurally. Therefore, good attention to procedural anxiety, although important to improve tolerance, is unlikely to change test acceptance.

Test preparation was found to be significantly more problematic for colonoscopy than gastroscopy patients, supporting findings in previous studies (32,35). However, our results suggest that despite the significant distress related to test preparation for the colonoscopy participants, it was not explanatory of procedure acceptance levels by itself.

In patients undergoing a colonoscopy, pain during the test was not strongly related to anticipated pain; ie, patients did not experience more pain just because they anticipated more pain. As well, the actual pain experienced did not relate to the specific scope concerns reported after the test. Even though patients experienced less pain than they thought they would, test acceptance did not change. Further, there was no significant difference between pain levels reported by colonoscopy or gastroscopy patients, and yet, nearly all of the gastroscopy patients reported acceptance postprocedurally. These findings suggest that patients' acceptance of a colonoscopy is not primarily determined by their level of actual pain control. As with procedural anxiety, procedural analgesia is valuable to improve tolerance. However, good pain control itself does not improve acceptance of colonoscopy.

In our study, anticipated pain was identified as a predictor of pretest acceptability, suggesting that it is a barrier to accepting colonoscopy. Patient concern regarding pain has been reported by others to be significant in contributing to nonuptake of screening (32,33). In another study (20), an overwhelming majority of primary care physicians cited procedural pain as an important factor in contributing to their patients' noncompliance with screening recommendations.

Currently available patient education literature is both vague and dismissive of procedural pain. For example, the American Gastroenterology Association's Web site has a patient education page (36) that makes two references to procedural pain when discussing colonoscopy. One statement is that everything will be done to ensure procedural comfort and the other reference states that the test causes little or no discomfort. It is imperative to recognize that health care professionals and patients may view pain concerns differently (31), and as a result, patient concerns may not be dealt with adequately.

In our study, two of the embarrassment items on the Endoscopy Concerns Scale (distress regarding buttock exposure and distress about body position) approached statistical significance with regard to their relationship with preprocedural acceptance, suggesting some tentative support for the importance of this concern and confirming other findings (20,32).

While other studies have questioned the role of embarrassment, reporting that it was infrequently raised by participants (35) or that a Pap smear was rated as more embarrassing than colonoscopy (37), these latter studies were assessing enrollees in a cancer screening program who are, by definition, already compliant with cancer screening and who had agreed to colonoscopy.

A recent study (38) examined differences in patient experience of those undergoing three colon imaging procedures: barium enema, colonoscopy and computed tomographic colonography. Six hundred fourteen individuals were studied (70% were male) and all of them had an indication for investigation (hematochezia, iron-deficiency anemia or positive occult blood stools). They agreed to undergo three sequential studies and complete questionnaires regarding their experience after the procedures were completed. Of those three procedures, colonoscopy caused the least pain, worry, discomfort, embarrassment, fatigue and inconvenience. However, when asked about willingness to repeat a colonoscopy, only 52% of this symptomatic clinical population was agreeable, which was lower than our sample and well below the acceptance level of patients who underwent gastroscopy. The findings of that study demonstrate the importance of delineating the intrinsic test characteristics of a colonoscopy and determining how to modify them, if the test is to become an acceptable adjunct or primary screening modality.

Our study was exploratory, and therefore had limitations. First, the sample size was small. A larger sample size may have provided support for other dimensions that impact on acceptance. The second limitation pertains to the lack of validated procedure-specific questionnaires to capture important test dimensions. It is difficult to compare constructs across studies because they use different measures that vary in the adequacy of their psychometric properties.

We created tools based on patient input and clinical experience. The Endoscopy Concerns Scale in particular was found to have good internal consistency, as well as convergent and discriminant validity. It appears to be a useful instrument to assess patient endoscopy experience in the future. Of interest, the recent study comparing patient experiences across different colon imaging modalities (38) independently

identified and developed similar questions, further supporting content validity.

Finally, participants in the present study were medical patients, many of whom were having an endoscopy for investigative rather than screening purposes, which limits generalizability of the findings regarding community screening compliance. Conversely, sampling exclusively from those who do proceed with screening colonoscopy introduces a bias; these individuals have presumably concluded that the test is reasonably acceptable, and as such, would provide little information on the large majority of those eligible or at risk who choose not to proceed.

Thus, we believe that our medical population facilitated mapping the procedural experience to explore test-intrinsic barriers contributing to acceptance. Preprocedural concerns and interventions targeting those perceptions could be assessed in a community sample of individuals who are eligible for screening, with attention to differences in those who are compliant and noncompliant.

We believe all dimensions of test acceptance need to be explored. However, our study highlights the necessity for researchers to examine beyond the element of test tolerance. Recent cancer screening trends in the United States continue to demonstrate poor uptake of colon cancer screening (39). Even among those compliant with other forms of cancer screening, their participation in colon cancer screening has been shown to be lower (37).

Other dimensions of a colonoscopy, namely anticipatory pain and test embarrassment, warrant further study. Recognition of these will lead to improvements in their measurement and, ultimately, the development of specific interventions to address them. Dimensions of test acceptance need to be considered in concert with planning colon cancer screening programs to ensure their success.

ACKNOWLEDGEMENTS: This work has been supported by AstraZeneca Canada and the Canadian Institutes of Health Research.

APPENDIX 1
Endoscopy Concerns Scale

Instructions: Many people have never had a scope test before and may have some concerns regarding what it might be like. Below is a list of concerns that people have sometimes expressed regarding these types of tests. Please read each statement carefully and circle the number that best reflects your response regarding distress you may have experienced in the past week

In regards to your upcoming colonoscopy/gastroscopy, how much, if any, have you been distressed by concerns about:	**Not at all**									**Extremely**
1. Telling friends/colleagues the nature of my upcoming test	1	2	3	4	5	6	7	8	9	10
2. Diarrhea prior to the test *(Fasting prior to the test)*	1	2	3	4	5	6	7	8	9	10
3. Discomfort prior to the test	1	2	3	4	5	6	7	8	9	10
4. Buttocks exposed during the test *(Gagging during the test)*	1	2	3	4	5	6	7	8	9	10
5. Loss of control of gas during the test *(Sensations of choking during the test)*	1	2	3	4	5	6	7	8	9	10
6. Loss of control of stool during the test *(Vomiting during the test)*	1	2	3	4	5	6	7	8	9	10
7. Doctor seeing my stool in the bowel during the test *(Doctor seeing my food in the stomach during the test)*	1	2	3	4	5	6	7	8	9	10
8. Expressing emotions during the test	1	2	3	4	5	6	7	8	9	10
9. Saying unintended things during the test	1	2	3	4	5		7	8	9	10
10. Body position assumed during the test	1	2	3	4	5	6	7	8	9	10
11. Insertion of the scope into my rectum *(Insertion of the scope into my esophagus)*	1	2	3	4	5	6	7	8	9	10
12. Insertion of intravenous line into my hand	1	2	3	4	5	6	7	8	9	10
13. Discomfort during the procedure	1	2	3	4	5	6	7	8	9	10
14. Discomfort after the procedure	1	2	3	4	5	6	7	8	9	10

Questions in italics and parentheses represent adaptations for the gastroscopy questionnaire

REFERENCES

1. Mandel JS, Church TR, Bond JH, et al. The effect of fecal occult-blood screening on the incidence of colorectal cancer. N Engl J Med 2000;343:1603-7.
2. Winawer S, Fletcher F, Rex D, et al, for the Gastrointestinal Consortium Panel. Colorectal cancer screening and surveillance: Clinical guidelines and rationale – update based on new evidence. Gastroenterology 2003;124:544-60.
3. Breen N, Wagener DK, Brown ML, Davis WW, Ballard-Barbash R. Progress in cancer screening over a decade: Results of cancer screening from the 1987, 1992, and 1998 National Health Interview Surveys. J Natl Cancer Inst 2001; 93:1704-13.
4. Subramanian S, Klosterman M, Amonkar MM, Hunt TL. Adherence with colorectal cancer screening guidelines: A review. Prev Med 2004;38:536-50.
5. Cokkinides V, Chao A, Smith RA, Vernon SW, Thun MJ. Correlates of underutilization of colorectal cancer screening among US adults, age 50 years and older. Prev Med 2003;36:85-91.
6. Chao A, Connell CJ, Cokkinides V, Jacobs EJ, Calle EE, Thun MJ. Underuse of screening sigmoidoscopy and colonoscopy in a large cohort of US adults. Am J Public Health 2004;94:1775-81.
7. Rosen AB, Schneider EC. Colorectal cancer screening disparities related to obesity and gender. J Gen Intern Med 2004;19:332-8.
8. Walsh JM, Kaplan CP, Nguyen B, Gildengorin G, McPhee SJ, Perez-Stable EJ. Barriers to colorectal cancer screening in Latino and Vietnamese Americans. Compared with non-Latino white Americans. J Gen Intern Med 2004;19:156-66.
9. Mandelson MT, Curry SJ, Anderson LA, et al. Colorectal cancer screening participation by older women. Am J Prev Med 2000;19:149-54.
10. Kelly RB, Shank JC. Adherence to screening flexible sigmoidoscopy in asymptomatic patients. Med Care 1992;30:1029-42.
11. Holt WS Jr. Factors affecting compliance with screening sigmoidoscopy. J Fam Pract 1991;32:585-9.

12. Hawley ST, Vernon SW, Levin B, Vallejo B. Prevalence of colorectal cancer screening in a large medical organization. Cancer Epidemiol Biomarkers Prev 2004;13:314-9.
13. Baig N, Myers RE, Turner BJ, et al. Physician-reported reasons for limited follow-up of patients with positive fecal occult blood test screening results. Am J Gastroenterol 2003;98:2078-81.
14. Dulai GX, Farmer MM, Ganz PA, et al. Primary care provider perceptions of barriers to and facilitators of colorectal cancer screening in a managed care setting. Cancer 2004;100:1843-52.
15. Tu SP, Taylor V, Yasui Y, et al. Promoting culturally appropriate colorectal cancer screening through a health educator: A randomized controlled trial. Cancer 2006;107:959-66.
16. Ferreira MR, Dolan NC, Fitzgibbon ML, et al. Health care provider-directed intervention to increase colorectal cancer screening among veterans: Results of a randomized controlled trial. J Clin Oncol 2005;23:1548-54.
17. Centers for Disease Control and Prevention (CDC). Colorectal cancer test use among persons aged > or = 50 – United States, 2001. MMWR Morb Mortal Wkly Rep 2003;52:193-6.
18. US Department of Health and Human Services. Healthy People 2010: Understanding and Improving Health, 2nd edn. Washington: US Government Printing Office, 2000.
19. Dominitz JA, Provenzale D. Patient preferences and quality of life associated with colorectal cancer screening. Am J Gastroenterol 1997;92:2171-8.
20. Lemon SC, Zapka JG, Estabrook B, Erban S, Luckmann R. Screening for colorectal cancer on the front line. Am J Gastroenterol 2003;98:915-23.
21. Zubarik R, Ganguly E, Benway D, Ferrentino N, Moses P, Vecchio F. Procedure-related abdominal discomfort in patients undergoing colorectal cancer screening: A comparison of colonoscopy and flexible sigmoidoscopy. Am J Gastroenterol 2002;97:3056-61.
22. Hilzenrat N, Fich A, Odes HS, et al. Does insertion of a rectal tube after colonoscopy reduce patient discomfort and improve satisfaction? Gastrointest Endosc 2003;57:54-7.
23. Nicholson FB, Korman MG. Comparison of endoscopic procedures for colorectal cancer screening in women with mammography and Pap smear. Gastrointest Endosc 2004;60:400-7.
24. Bretthauer M, Hoff G, Thiis-Evensen E, et al. Carbon dioxide insufflation reduces discomfort due to flexible sigmoidoscopy in colorectal cancer screening. Scand J Gastroenterol 2002;37:1103-7.
25. Bell GD. Preparation, premedication, and surveillance. Endoscopy 2004;36:23-31.
26. Heuss LT, Drewe J, Schnieper P, Tapparelli CB, Pflimlin E, Beglinger C. Patient-controlled versus nurse-administered sedation with propofol during colonoscopy. A prospective randomized trial. Am J Gastroenterol 2004;99:511-8.
27. Bhardwaj G, Conlon S, Bowles J, Baralt J. Use of midazolam and propofol during colonoscopy: 7 years of experience. Am J Gastroenterol 2002;97:495-7.
28. Rudner R, Jalowiecki P, Kawecki P, Gonciarz M, Mularczyk A, Petelenz M. Conscious analgesia/sedation with remifentanil and propofol versus total intravenous anesthesia with fentanyl, midazolam, and propofol for outpatient colonoscopy. Gastrointest Endosc 2003;57:657-63.
29. Drossman DA, Brandt LJ, Sears C, Li Z, Nat J, Bozymski EM. A preliminary study of patients' concerns related to GI endoscopy. Am J Gastroenterol 1996;91:287-91.
30. Ringel Y, Dalton CB, Brandt LJ, et al. Flexible sigmoidoscopy: The patients' perception. Gastrointest Endosc 2002;55:315-20.
31. Kim LS, Koch J, Yee J, Halvorsen R, Cello JP, Rockey DC. Comparison of patient's experiences during imaging tests of the colon. Gastrointest Endosc 2001;54:67-74.
32. Harewood GC, Wiersema MJ, Melton LJ III. A prospective, controlled assessment of factors influencing acceptance of screening colonoscopy. Am J Gastroenterol 2002; 97:3186-94.
33. Weinberg DS, Turner BJ, Wang H, Myers RE, Miller S. A survey of women regarding factors affecting colorectal cancer screening compliance. Prev Med 2004;38:669-75.
34. Wardle J, Williamson S, Sutton S, et al. Psychological impact of colorectal cancer screening. Health Psychol 2003;22:54-9.
35. Nicholson FB, Korman MG. Acceptance of flexible sigmoidoscopy and colonoscopy for screening and surveillance in colorectal cancer prevention. J Med Screen 2005;12:89-95.
36. American Gastroenterological Association. Patient Education Page. <http://www.gastro.org/wmspage.cfm?parm1=858> (Version current at November 27, 2007).
37. Hay JL, Ford JS, Klein D, et al. Adherence to colorectal cancer screening in mammography-adherent older women. J Behav Med 2003;26:553-76.
38. Bosworth HB, Rocke DC, Paulson EK, et al. Prospective comparison of patient experience with colon imaging tests. Am J Med 2006;119:791-9.
39. Harewood GC, Lieberman DA. Colonoscopy practice patterns since introduction of medicare coverage for average-risk screening. Clin Gastroenterol Hepatol 2004;2:72-7.