Controversies in Ulcerative Colitis: A Survey Comparing Decision Making of Experts Versus Community Gastroenterologists

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Background & Aims: **Despite the development of consensus guidelines in ulcerative colitis (UC), there remain several areas of uncertainty in the everyday management of this incompletely understood disease. We performed a national vignette survey to measure variations in decision-making in areas of controversy.** ***Methods:*** **We constructed a survey with 3 vignettes to measure decision-making in 4 areas of controversy in UC: (1) dysplasia management, (2) mesalamine dosing, (3) diagnostic testing for underlying Crohn's disease, and (4) treatment of steroid-refractory inpatient UC. We compared responses between a group of community gastroenterologists and UC experts.** ***Results:*** **We received 192 responses (36% response). Compared with community gastroenterologists, UC experts were more likely to endorse colectomy for both unifocal and multifocal low-grade dysplasia, use narrow band imaging and chromoendoscopy for surveillance colonoscopy, use high-dose mesalamine for inducing remission, use long-term mesalamine for cancer chemoprevention, order computed tomography enterography to evaluate for Crohn's disease, and to have a lower threshold to call for surgery consultation in steroid-refractory UC. There was little agreement regarding the optimal frequency of surveillance colonoscopy, even among experts. Most respondents favored using infliximab over cyclosporine in steroid-refractory UC.** ***Conclusions:*** **Community gastroenterologists and UC experts vary dramatically in their approach to many areas of uncertainty in UC. The only area of consensus between groups is the use of infliximab over cyclosporine in steroid-refractory UC, itself a controversial decision. These data suggest that current practice patterns are highly disparate and focus attention on specific areas of disconnect that should be further investigated.**

Ulcerative colitis (UC) is a prevalent and expensive condition that impairs quality of life.[1–3] The large burden of illness of UC has spurred interest in developing improved diagnostic and therapeutic approaches, a process that has yielded novel diagnostic testing strategies, improved dysplasia surveillance practices, development of new therapies, and enhancements of older treatments. There is now sufficient evidence to support a set of best practices for the management of UC.[4–7] Yet despite the development of consensus guidelines for UC,[3–6] there remain several areas of uncertainty in the everyday management of this incompletely understood disease.

Four areas in particular are marked by clinical uncertainty: (1) screening and management of dysplasia, including the appropriateness of colectomy for flat low-grade dysplasia (LGD), use of chromoendoscopy or narrow band imaging (NBI) in surveillance, and the optimal frequency of surveillance colonoscopies; (2) use of mesalamine products, including optimal dosing and duration, optimal formulation, and use of mesalamine for cancer chemoprevention; (3) appropriateness of searching for underlying Crohn's disease in UC; and (4) treatment of steroid-refractory inpatient UC, including selection between cyclosporine (CSA) versus infliximab and the optimal timing of surgery.

Each area is marked by uncertainty about what constitutes best practice, yet gastroenterologists face these issues daily and must make decisions in the absence of evidence-based guidelines. Without explicit guidance, different physicians might use different diagnostic tests, prescribe different therapies, and follow disparate management algorithms when faced with the same set of facts, a phenomenon that occurs in all areas of medicine, even when practice guidelines are available.[8–10] In the field of gastroenterology, for example, we have demonstrated wide practice variations in Crohn's disease,[8] irritable bowel syndrome,[11] and nonvariceal hemorrhage.[12] Although minor variations in the process of care are an expected by-product of modern health care, extreme variations denote poor consensus and poor quality of care, a fundamental principle of quality improvement initiatives.[13–15] Wide practice variations might have several explanations, including the need for more evidence to determine the best course of action, the possibility that multiple approaches might be equally effective for a clinical scenario, or the need for existing evidence to be more effectively consolidated into guidelines and disseminated into practice. Recent efforts to improve the health care quality have focused on reducing extreme variations in diagnostic and therapeutic decision-making.[12–14] As an initial effort to quantify the degree of variation in UC decision-making, we performed a national survey to measure beliefs of UC experts and community gastroenterologists regarding areas of uncertainty.

Abbreviations used in this paper: CSA, cyclosporine; CT, computed tomography; DI, disagreement index; LGD, low-grade dysplasia; MMX, multi-matrix system; MR, magnetic resonance; NBI, narrow band imaging; RAS, RAND appropriateness scale.

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Table 1. Demographic and Practice-Pattern Information of Respondents

Variable	Mean ± SD, experts (N = 25)	Mean ± SD, community providers (N = 150)	*P* value
Age (*mean y*)	45.8 ± 1.3	50.4 ± 9.3	.03
Male gender	95.8%	90.5%	.4
Years in practice	25.1 ± 4.2	25.5 ± 1	.88
Clinical gastroenterology practice	57.6%	80.1%	.002
Clinical research practice	26.7%	7.5%	<.0001
Member of Crohn's and Colitis Foundation of America (CCFA) (%)	75%	32%	.0001
Number of UC patients seen per month	128 ± 17	25 ± 4	<.0001
Practice setting (%)			
Private practice	8	53	
Health maintenance organization	0	3	
University-based practice	88	16	
Veterans Affairs hospital	0	12	
Other	4	16	<.001
Geographic location (%)			
West	13	36	
Midwest	26	19	
South	19	28	
Northeast	31	17	
International	5	0	<.001

Methods

Overview of Clinical Vignette Survey Methodology

Vignette survey design. We developed an online survey with 3 vignettes to evaluate scenarios in the diagnosis and management of UC. We developed the vignettes in concert with experts in UC and survey design specialists to ensure face validity, comprehensibility, and comprehensiveness. Each vignette began with a standardized patient presentation and was followed by management questions regarding diagnostic testing, treatment, and follow-up. The questions included vertical single best answers, horizontal matrix items, and open-ended items. The first vignette described an outpatient with a history of limited proctitis, presenting with a flare that partially responded to 2.4 g of oral mesalamine. The second vignette depicted a patient with left-sided colitis, low-grade fever, and a symptom flare. The third vignette described an inpatient with UC and a flare persisting despite 6 days of intravenous steroids. Refer to the Appendix (see supplemental material online at www.cghjournal.org) for the full vignettes.

Sampling Frame

We surveyed 2 groups of physicians (Table 1). The first group was a sample of 40 experts in UC. We identified these experts in a qualitative manner on the basis of their publication records during the last 5 years, leadership roles on advisory councils of the Crohn's and Colitis Foundations of America, and memberships on guideline committees. We used the term *expert* in reference to this group. The second group was a random sample of 500 gastroenterologists listed in the American Medical Association Masterfile. We use the term *non-expert* in reference to this largely community-based group.

Sample Size Considerations

Assuming 15 subjects for each of 10 potential independent predictors in multivariable regression analysis, we required a minimum of 150 to complete the survey to avoid overmatching of the regression models. Assuming a 30% response rate, we required at least 500 physicians to survey in the sampling frame.

Survey Distribution and Follow-up Procedures

Respondents received the survey electronically by using an online questionnaire platform (Survey Monkey software). Physicians received e-mails with cover letters and a link to online survey. Nonresponders after 2 weeks received a follow-up e-mail. One week after the second e-mail correspondence, a paper version of the questionnaire was mailed to nonresponders. With baseline data from the AMA Masterfile, we compared responders with nonresponders for age, gender, region, practice setting, and years in practice.

Analyses

We measured the level of agreement between expert and community provider groups within 4 areas of controversy.

(1) Controversies in surveillance and management of dysplasia. *Appropriateness of colectomy.* Although there are areas of consensus regarding the indication for colectomy in dysplasia,[5] there are scenarios where the appropriateness of colectomy remains uncertain. We included 4 "mini" vignettes of young (35 years old) UC patients with varying dysplasia scenarios that are not explicitly addressed in published guidelines, including 2 cases with flat LGD, 3 cases with a solitary 4-mm adenoma, and 1 case of diffuse pseudopolyposis (Table 2). Respondents were informed that the patients had quiescent UC, no primary sclerosing cholangitis, and no family history of colon cancer. In each scenario, respondents rated the appropriateness of colectomy by using a standard 9-point RAND appropriateness scale (RAS), with the following interpretation: scores 1–3 = generally inappropriate; scores 4–6 = unsure; scores 7–9 = generally appropriate.[16] We compared mean RAS scores between experts and non-experts by using a 2-sided *t* test and with a *P* value <.05 as significant. To quantify

Table 2. Expert Versus Non-Expert Beliefs About Appropriateness of Colectomy in 6 Different Clinical Scenarios

Patient scenarios	Experts			Non-Experts			RAS
	Mean RAS	% Endorse	DI	Mean RAS	% Endorse	DI	*P* value
35-year-old with single, 4-mm adenoma in involved area, removed with snare polypectomy. Adjacent biopsies normal.	2.68	12.5	0.49	2.24	14.2	0.29	.28
35-year-old with unifocal flat LGD	6.80	75.0	−3.80	5.60	47.5	1.90	.02
35-year-old with 50–60 pseudopolyps, with sampling of 5, all showing inflammation but no dysplasia	3.10	12.5	0.68	2.60	14.1	0.29	.29
35-year-old with multifocal flat LGD	8.70	100.0	0.00	7.40	77.0	−2.10	.003
35-year-old with single, 4-mm sessile adenoma in involved area, removed with polypectomy. Adjacent biopsies are normal.	1.60	12.5	0.03	2.40	12.5	0.29	.06
35-year-old with single, 4-mm adenoma in uninvolved area, removed with polypectomy. Adjacent biopsies are normal.	3.70	15.0	0.76	2.30	21.0	0.28	.001

NOTE. Appropriateness is measured on a 9-point RAS, where 1–3 = generally inappropriate, 4–6 = unsure, and 7–9 = generally appropriate. Endorsement is defined as scoring an RAS of 7–9. For example, 75% of experts endorsed colectomy in scenario 2, a 35-year-old with unifocal flat LGD. Variation within group is measured by using the RAND DI, where a DI ≥ 1.0 indicates extreme variation in ratings.

the level of agreement, we also calculated the RAND/UCLA disagreement index (DI) for each factor.[16] A DI >1.0 indicates extreme variation in beliefs. DI values below 1.0, including negative values, reflect increasing levels of agreement.[26] The DI is calculated with a standard published equation.[8,16] In addition, we defined dichotomous endorsement of colectomy for each scenario as an RAS score of 7–9, as has been performed in previous studies,[8] and compared endorsement between groups with a χ^2 test. We then performed multivariate logistic regression analysis to determine whether any provider or practice-type characteristics were associated with endorsement of colectomy.

Frequency of surveillance colonoscopies. We measured beliefs about competing dysplasia surveillance guidelines. We asked the following question: "Once you begin surveillance for dysplasia in left-sided colitis, how frequently would you do it?" There were 6 choices (Table 3), including 2 variants of the American Gastroenterological Association guidelines (annual or biannual surveillance indefinitely),[17] the British Society of Gastroenterology guidelines (surveillance every 3 years, then every 2 years after 20 years of disease, then annually after 30 years of disease),[18] surveillance every 3 years indefinitely, and surveillance in 1 year, if negative repeat every 3 years, then annually after 20 years. Respondents could also specify alternative surveillance practices. We compared endorsement of each guideline between groups with a χ^2 test and used a *P* value of <.05 as evidence for significance.

Use of chromoendoscopy and narrow band imaging. We posed the following question about dysplasia surveillance: "When performing surveillance colonoscopy in a UC patient with quiescent pancolitis, do you routinely use targeted biopsy techniques such as chromoendoscopy or narrow-band imaging?" We compared binary responses between groups by using a χ^2 test and performed multivariable logistic regression to identify predictors of chromoendoscopy or NBI use in UC.

(2) Controversies regarding use of mesalamine in ulcerative colitis. *Dose and delivery of mesalamine for induction.* There is controversy regarding the appropriateness of using low-dose (ie, 2.4 g mesalamine equivalent) versus high-dose (ie, 4.8 g) mesalamine for induction of remission in mild to moderate UC.[19,20] Moreover, there are several mesalamine delivery systems available. Respondents endorsing the use of mesalamine in vignette #2 were asked to select among the following: balsalazide 6.75 g, mesalamine 2.4 g, mesalamine 4.8 g, micronized mesalamine 4 g, delayed-release (ie, multimatrix system [MMX]) mesalamine 2.4 g, delayed-release mesalamine 4.8 g, and sulfasalazine titrated up to 4 g daily as tolerated. We compared endorsement of each agent between the expert and non-expert groups and compared endorsement of high- versus low-dose mesalamine between groups by using a χ^2 test. We subsequently performed multivariable logistic regression to identify predictors of high- versus low-dose mesalamine for induction.

Table 3. Expert Versus Non-Expert Endorsement of Competing Dysplasia Surveillance Guidelines

Surveillance guideline	Experts (% endorsing)	Non-Experts (% endorsing)	*P* value
Annual surveillance indefinitely	17	23	.53
Surveillance every 2 y indefinitely	21	28	.45
Surveillance every 3 y indefinitely	4	3	.84
Surveillance in 1 y, if negative repeat every 3 y, then annually after 20 y	21	12	.28
Surveillance every 3 y, then every 2 y after 20 y of disease, then annually after 30 y of disease	16	14	.75
"Other" guidelines (open-ended responses – variable)	21	20	.84

NOTE. There were no significant differences across groups. Within groups, there was a higher preference for performing annual or every other year surveillance (expert analysis of variance *P* value = .08; non-expert analysis of variance *P* value <.001).

Table 4. Expert Versus Non-Expert Beliefs About Appropriateness of Various Diagnostic Tests for Underlying Crohn's Disease in UC

Diagnostic tests	Experts			Non-Experts			RAS, *P* value
	Mean RAS	% Endorse	DI	Mean RAS	% Endorse	DI	
Small bowel follow-through	3.85	25.0	0.74	3.12	18.3	0.74	.18
Upper endoscopy	2.1	8.3	0.29	1.95	11.6	0.29	.64
Wireless capsule endoscopy	1.7	8.3	0.17	2.3	14.1	0.29	.19
MRI enterography	3.6	33.3	1.3	2	13.3	0.29	.0003
CT enterography	4.6	33.0	1.8	2.3	15.0	0.29	<.0001
IBD serologies (eg, ANCA, ASCA, Omp-C)	1.8	8.3	0.13	3.8	24.1	0.65	.0001

Use of indefinite mesalamine after induction. Once remission is induced with mesalamine therapies, it remains unclear whether indefinite therapy is warranted to maintain remission, especially among those already on maintenance immunomodulators.[19,20] Similarly, it is uncertain whether long-term mesalamine has important benefits for cancer chemoprevention.[19,21,22] We asked the following question: "In a patient with UC in remission on 6MP/AZA, do you continue 5-ASA products?" Respondents were instructed to select all that apply among the following choices: (1) "No, I taper them off to reduce pill burden"; (2) "No, I taper them off because it is not incrementally effective"; (3) "Yes, for purposes of treatment of disease"; and (4) "Yes, for purposes of cancer chemoprevention." We compared responses between groups by using χ^2 tests.

(3) Appropriateness of testing for underlying Crohn's disease in ulcerative colitis. Because Crohn's disease involving the colon might be phenotypically similar to UC, there is often uncertainty about when and how to search for possible underlying Crohn's disease in patients carrying a diagnosis of UC. We therefore compared diagnostic decision-making between and within groups regarding testing for underlying Crohn's disease. We explicitly designed vignette #2 to represent a "standardized" patient with presumptive left-sided UC and minimized signs or other clinical clues for underlying Crohn's disease. Following a set of management questions, we posed the following: "As part of the subsequent diagnostic evaluation, what, if any, additional diagnostic tests would you order?" Respondents viewed a set of diagnostic tests that could be used to identify possible underlying Crohn's disease (Table 4). Each test was rated by using the RAS. We calculated DI statistics for each group of ratings and compared endorsement between groups by using a χ^2 test.

(4) Management of steroid-refractory inpatient ulcerative colitis. Patients with severe, steroid-refractory UC pose a clinical challenge, and the optimal management remains uncertain.[23] We asked respondents to select from a list of treatment options (Table 5) for vignette #3 (severe steroid-resistant UC). We compared endorsement of each option between groups by using a χ^2 test.

Results

Sample Characteristics

Table 1 displays the characteristics of the survey respondents. One hundred ninety-two respondents returned their surveys, including 25 of 40 UC experts (63% response) and 150 of 500 non-experts (30% response). The expert group was younger, more likely to practice in a university-based setting, more likely to be a member of the Crohn's and Colitis Foundation of America, and more likely to be engaged in conducting clinical research. Although the expert group had a smaller proportion of time dedicated to clinical care, they evaluated significantly more UC patients per month versus the non-expert group. There were no significant differences between responders and nonresponders for age (49.7 ± 9.5 vs 50.4 ± 8.2 years; P = NS), male gender (91.4% vs 89.2%; P = NS), years in practice (25.5 ± 12.4 vs 26.2 ± 10.8; P = NS), practice setting, or region of practice (eg, West Region = 32.7% vs 30.1%; South = 26.7% vs 28.2%; Northeast = 19% vs 17.6%, etc; P = NS for all comparisons).

Controversies in Surveillance and Management of Dysplasia

Appropriateness of colectomy. Table 2 lists the results of the expert and non-expert ratings regarding the appropriateness of colectomy in each of the 6 "mini" clinical vignettes. In the unifocal LGD scenario, 75% of experts believed colectomy is generally appropriate (ie, RAS score of 7–9) versus 47% of non-experts (P = .01). Although experts were consistent in their shared belief about colectomy for unifocal LGD (DI, −3.8), community gastroenterologists exhibited "extreme variation" in their belief (DI, 1.9). In the multifocal LGD scenario, 100% of experts endorsed colectomy versus 77% of non-experts (P = .008). Both experts and non-experts were internally consistent in their beliefs about multifocal LGD (expert DI, −4.0; non-expert DI, −2.7). In logistic regression adjusting for provider demographics, practice setting, expert status, society memberships, and clinical UC load, experts remained more than 14 times more likely to endorse colectomy for unifocal flat LGD than non-

Table 5. Expert Versus Non-Expert Endorsement of Competing Management Strategies in Steroid-Refractory Inpatient UC

Management strategy	Experts (% endorsing)	Non-Experts (% endorsing)	*P* value
Increase steroid dose	0.0	3.0	.36
Keep steroid, add infliximab	54.0	53.0	.91
Stop steroid, add infliximab	8.3	9.2	.89
Call surgical evaluation	50.0	16.8	.0003
Keep steroid, add CSA	33.3	22.6	.27
Stop steroid, add CSA	0.0	2.5	.43

NOTE. Respondents could choose multiple simultaneous treatments (thus totals exceed 100%).

experts (odds ratio, 14.7; 95% confidence interval, 2.6–81.6). The differences in beliefs regarding colectomy were less pronounced in the remaining scenarios.

Frequency of surveillance colonoscopy. Table 3 provides the data regarding preferred surveillance strategy between experts and non-experts. Within groups, non-experts were more likely to prefer the American Gastroenterological Association guidelines (annual or biannual surveillance indefinitely) ($P < .001$). This was repeated in the expert group, although the preference was not statistically significant ($P = .08$). The least preferred strategy in both groups was surveillance every 3 years indefinitely.

Use of narrow band imaging and chromoendoscopy. The expert group was more likely to endorse the use of NBI or chromoendoscopy as part of surveillance colonoscopy compared with the non-expert group (32% vs 11%; $P = .01$). This endorsement remained significant after adjusting for key covariates in regression analysis.

Controversies Regarding Use of Mesalamine in Ulcerative Colitis

Dose and delivery of mesalamine for induction. Ninety-four percent of responders endorsed using a mesalamine product in vignette #1. Of these, 54% endorsed mesalamine, 17% delayed-release (MMX) mesalamine, 11% sulfasalazine, 9% balsalazide, and 3% micronized mesalamine. Fifty-six percent endorsed high-dose mesalamime (4.8 g mesalamine equivalent) to induce remission. There was a trend toward more experts versus non-experts endorsing high-dose mesalamine (71% vs 53%; $P = .1$).

Use of indefinite mesalamine after induction. Twenty-one percent of responders endorsed indefinite mesalamine after induction of remission with mesalamine. However, if the patient subsequently required 6-mercaptopurine to induce remission, then 66% endorsed long-term mesalamine. Of those endorsing indefinite mesalamine, 33% believed mesalamine is indicated for cancer chemoprevention. In logistic regression adjusting for provider characteristics, experts remained more than 5 times more likely to endorse indefinite mesalamine in remission (odds ratio, 5.3; 95% confidence interval, 1.5–18.5) and more than 4 times more likely to use mesalamine for chemoprevention (odds ratio, 4.5; 95% CI, 1.3–15.5) versus non-experts.

Appropriateness of testing for underlying Crohn's disease in ulcerative colitis. Table 4 displays the results regarding diagnostic testing for Crohn's disease in UC. Sixty-five percent of respondents endorsed at least 1 additional test to evaluate for underlying Crohn's disease in vignette #2, including small bowel follow-through, esophagogastroduodenoscopy, wireless capsule endoscopy, magnetic resonance (MR) enterography, computed tomography (CT) enterography, or serologies. There was no difference between expert (75%) and non-expert (63%) groups for ordering at least 1 test ($P = .24$). However, experts were more likely to endorse MR or CT enterography versus non-experts ($P < .001$ for both). In contrast, experts were significantly less likely to endorse IBD serologies (8.3% vs 24%; $P = .0001$). The DI results revealed that both experts and non-experts were internally consistent in their beliefs regarding all tests except use of MR imaging enterography and CT enterography. For these tests, the expert group revealed extreme variation in their beliefs (DI for MR imaging, 1.3; DI for CT, 1.8).

Management of steroid-refractory inpatient ulcerative colitis. Table 5 provides the data regarding management of steroid-refractory inpatient UC. Across groups, respondents favored the use of infliximab over cyclosporine (CSA) (infliximab, 62%; CSA, 26%; $P < .0001$). This belief did not vary significantly between expert and non-expert groups. Experts were more likely to consult surgery versus non-experts (50% vs 17%; $P = .0003$). Both groups were consistent that increasing the steroid dose further was not warranted, and that other maneuvers were required instead.

Discussion

There is uncertainty about what constitutes best practice in UC. To proceed with additional guideline development, it is important to first understand current practice patterns, measure process of care, and identify areas of consensus and variation in UC. If current practice is consistent among providers, then it would indicate that future efforts to develop guidelines and quality indicators will be straightforward and uncontroversial. However, if current practice varies widely among providers, then it would suggest that more evidence is needed to determine the best course of action in areas of uncertainty. This variation might also reflect a belief that there are multiple effective approaches for a clinical situation, or that existing evidence needs to be disseminated more effectively to practitioners. Moreover, if providers cannot agree on how best to manage UC, then establishing additional best practices for UC will be an exercise fraught with pitfalls, because extreme variation is an indicator of inadequate evidence, poor consensus, and even poor health care quality.[12–14] As a preliminary step, we sought to measure the current process of care and to identify the areas of consensus and variation in UC.

We found important differences regarding the use of colectomy in young patients with LGD. Whereas three fourths of UC experts recommend colectomy in unifocal LGD, less than half of community gastroenterologists share this view. However, we also found that community gastroenterologists have highly polarized beliefs about this clinical scenario. For multifocal LGD, experts in this survey unanimously endorse colectomy, whereas only 77% of non-experts share this recommendation. This disconnect suggests that efforts should be made to develop and disseminate evidence-based guidelines regarding management of flat LGD among patients with colitis, a goal with immediacy given the high stakes and severity of developing potentially avoidable colorectal cancer.

We found a wide variety of beliefs about the optimal guideline for dysplasia surveillance. Although both expert and non-expert groups tended to favor either annual or biannual surveillance indefinitely, nearly half of each group endorsed one of several alternative published guidelines. Moreover, 1 in 5 respondents supported one of several unpublished surveillance strategies, indicating that many providers "march to the beat of their own drum" with surveillance practices. This wide variation in practices might indicate that further research is necessary to better establish the evidence for competing approaches, and that it is premature to endorse any one guideline as representative of best practice. Moreover, it suggests that the wide variety of competing guidelines, in and of itself, is confusing to providers and a source of practice variation.

In this survey experts were more likely to endorse the use of chromoendoscopy or NBI as part of dysplasia surveillance in

UC. However, even among experts, the penetration of these techniques remains low. Although the disparity between experts and community providers might simply reflect experts' proximity to the technology, the disconnect also indicates that existing and emerging evidence supporting these techniques should be disseminated in literature summaries, educational seminars, and demonstrations to practicing community gastroenterologists.

We identified important differences between expert and non-expert groups regarding the use of mesalamine compounds in UC. In particular, compared with non-experts, UC experts are more likely to endorse indefinite mesalamine after induction of remission, to believe mesalamine has cancer chemopreventive properties, and to use high-dose mesalamine to induce remission in moderate UC. These variations indicate that further development and dissemination of evidence-based mesalamine guidelines are warranted to assist decision-making in these controversial areas. In addition, future research should measure the resource utilization implications and cost-effectiveness of long-term mesalamine use in UC, in terms of treatment effectiveness and cancer chemoprevention.

Despite purposefully creating a UC vignette without obvious clues for underlying Crohn's disease, most respondents ordered 1 or more additional diagnostic tests to evaluate for Crohn's disease. It has been established that some patients with an initial diagnosis of UC undergo a subsequent change of diagnosis to CD. Although clinical predictors of a change in diagnosis have been identified (eg, nonbloody diarrhea, weight loss at diagnosis),[24] none of these were apparent in the vignette. With the exception of serologic markers, all the diagnostic tests for Crohn's disease involved assessment of the small intestine, suggesting that small bowel evaluation might be an important component of the evaluation of moderate UC unresponsive to conventional therapy. In addition, we found that experts were more likely to endorse MR or CT enterography than non-experts, an indication that they are more familiar with these relatively new technologies, that these modalities are more readily available at the experts' institutions, or that non-experts are less eager to embrace these tests that yield higher quality images at the expense of radiation exposure (CT) or higher cost (MR) than conventional methods. Of note, even the expert group was internally conflicted regarding the appropriateness of MR and CT enterography, suggesting that experience with these technologies varies widely among key opinion leaders. This suggests that use of MR and CT enterography will remain inconsistent until, at the very least, experts themselves forge consensus about the appropriate use of these technologies.

There is debate about whether to use CSA or infliximab in patients with steroid-refractory inpatient UC.[23] Randomized controlled trials support both therapies,[25–28] although these studies vary in terms of sample size, previous steroid exposure, and patient illness severity. There are no guidelines to support one therapy over the other. We found that most respondents endorsed the use of infliximab over CSA, a finding that was consistent across groups. In contrast to CSA, there are limited long-term outcomes data on the use of infliximab in the setting of the hospitalized UC patient unresponsive to intravenous steroids, yet infliximab was the preferred treatment among both experts and non-experts. This suggests that factors other than published evidence might guide decision-making in this tenuous subpopulation, perhaps influenced by the availability or burden of daily CSA monitoring, influence of marketing campaigns for infliximab, or increased experience and physician comfort with infliximab. More long-term data for infliximab use in this setting are needed before an evidentiary basis can justify what appears to be the favored current practice.

A limitation of this study is that survey responses might not be reflective of actual decision-making in clinical practice. Directly observing patient-provider interactions is the gold standard for assessing process of care. However, this approach is also limited because of the Hawthorne effect, in which providers artificially alter their practice when they are knowingly observed. This undermines the efforts to capture the true process of care. Standardized patients[29] and medical record data abstraction[30] are alternatives. Notably, survey-based clinical vignettes are validated as an accurate surrogate for both chart abstraction and standardized patients.[31] An additional limitation is that our vignettes do not represent all possible scenarios in UC. Other investigators might have developed different vignettes with different details. However, we followed several steps to ensure adequate content validity of the vignettes, including consultation with key opinion leaders in UC, review by experts in survey design, and pilot testing for comprehensibility. Moreover, regardless of the precise content of the vignettes, all providers were faced with the same clinical data, yet they came to different conclusions on many occasions. Third, although we operationalized "extreme variation" by using a validated and quantitative method,[16] there is no gold standard for this construct. Moreover, variation itself is a natural consequence of medicine being as much art as science, and thus some basal level of variation is to be expected. However, our analyses reveal that the process of care in UC might vary widely between providers, more than would be expected by chance alone. Evidence has shown that extreme variation in care is an indicator of inadequate evidence, poor consensus, and even poor health care quality.[13] Although it might be disquieting to reveal these wide variations in UC, we believe it is important to highlight these variations because of the potential implications for current and future quality of care. Quantifying the current process of care allows both expert and community physicians to recognize the extreme variations in our approaches and to consider next steps to streamline care, always while recognizing that no 2 physicians will approach the same patient in the exact same way, and they should not.

Our survey is further limited by the relatively low response rate (30%). There might be systematic differences between responders and nonresponders. Nonresponders typically cite a wide range of reasons for their failure to participate, including not receiving the survey, believing the survey did not pertain to their practice, lacking sufficient time, or simply choosing not to participate. We cannot know the specific reasons for nonresponse to this survey. It is possible that nonresponders were too busy, did not receive the e-mail or paper surveys, or had other systematic differences, ie, do not evaluate enough IBD patients to feel comfortable taking the survey, do not participate in academic studies, are not clinically active, etc. With data from the AMA Masterfile, we were able to confirm that nonresponders were similar to responders in terms of age, gender, years in practice, practice settings, and geographic locations. This suggests that respondents were not systematically different from nonrespondents for key measured characteristics. Nonetheless, there might be unmeasured factors, including those described above, that remain systematically different between groups. As

with any provider survey, a higher response rate could have potentially altered the results, although it is difficult to accurately predict in what direction, if any, the results would be different.

In conclusion, we found wide variations in practice patterns in UC. In particular, compared with community gastroenterologists, UC experts are more likely to endorse colectomy for LGD, use NBI and chromoendoscopy for surveillance colonoscopy, use high-dose mesalamine for inducing remission, use long-term mesalamine for cancer chemoprevention, order CT and MR enterography to evaluate for underlying Crohn's disease, and to have a lower threshold to consult surgery in steroid-refractory UC. These variations indicate that best practices in these areas remain uncertain and should be subjected to further research and guideline development.

Supplementary Data

Note: To access the supplementary materials accompanying this article, visit the online version of *Clinical Gastroenterology and Hepatology* at www.cghjournal.org.

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Appendix

Clinical Vignette #1

Patient history. A 44-year-old woman with a history of UC, first diagnosed with limited proctitis 5 years ago, now presents to your office with a 2-month history of intermittent, crampy abdominal pain and loose, bloody stools up to 3 times daily. She has experienced infrequent flares that were successfully treated with Canasa suppositories roughly once every other year; these were discontinued shortly after symptom resolution. During the past year she has flared twice. One month ago she was placed on mesalamine (Asacol) 2.4 g by mouth daily in addition to nightly Canasa. Her bowel movement frequency subsequently decreased from 4 loose bowel movements daily to 2 bowel movements per day. However, she continues to have blood in her stool and lower abdominal cramping that generally improves with bowel movements.

She does not have weight loss, fevers, or chills. A total colonoscopy was performed 1 year ago while the patient was asymptomatic and showed mild chronic inflammation confined to 20 cm from anal verge, but no acute inflammation.

She has no allergies and takes no other medications. She does not smoke. She confirms that she does take her medication as prescribed.

Physical examination. Examination is only remarkable for mild left lower quadrant tenderness to palpation.

Laboratory tests. Complete blood count, chemistries, and stool studies for infectious etiologies, including *Clostridium difficile*, are negative; erythrocyte sedimentation rate is 18 (normal, 0–15).

Clinical Vignette #2

Patient history. A 32-year-old man with a history of UC, first diagnosed 4 years ago, is now referred to you by his primary doctor for complaints of recurrent, bloody diarrhea for the past 3 months. The patient reports having 3–5 loose, bloody bowel movements daily, with accompanying moderate lower abdominal pain. He reports intermittent subjective fevers during the past 1–2 weeks. His primary care physician obtained stool studies (including stool leukocytes, ova and parasites, bacterial cultures, *C difficile* toxin ×3), which thus far have all been unrevealing. The patient was started on mesalamine enemas and has been compliant with them.

Physical examination. On physical examination, he has a low-grade fever of 100.3°F, has a heart rate of 86, and a blood pressure of 136/84 mm Hg. He appears euvolemic. Abdominal exam reveals mild tenderness in the left lower quadrant with palpation, without rebound or guarding. Rectal examination reveals brown stool mixed with red blood.

Fig 1.

Endoscopic findings. Your endoscopic evaluation reveals diffuse moderate inflammation to the mid-transverse colon (Figure 1), with normal-appearing proximal colon; histopathology confirms mild to moderate acute and chronic inflammatory changes without granulomas, dysplasia, or infection, "consistent with inflammatory bowel disease" in the endoscopically affected segments, with normal histology proximally.

Clinical Vignette #3

Patient history. A 38-year-old woman with perinuclear antineutrophil cytoplasmic antibody–positive UC is admitted for a flare with 8–10 bloody bowel movements daily, despite long-standing 6-mercaptopurine (with therapeutic thioguanine levels) and 1 week of outpatient prednisone 40 mg daily. After 6 days of inpatient IV steroid therapy (methylprednisolone 20 mg 3 times a day), she still has 6–8 bloody bowel movements daily. Her blood pressure remains stable, and her mental status remains fully intact. Her examination is notable for diffuse tenderness to palpation but no peritoneal signs, rebound, or guarding. Cytomegalovirus and other enteric infections are not evident with stool studies and colonic biopsies. Erythrocyte sedimentation rate is 46, white blood cell count is 11,000 with 10% band forms, and electrolytes are within normal limits. CT scan reveals pancolonic thickening, but no bowel dilation. She says she does "not want to lose the colon if possible."