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The Role of Technology in Optimizing Colonoscopy Quality and Efficiency

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Introduction

With ongoing efforts to reform health care and contain related costs, steps have been taken to implement quality measures that optimize outcomes while ensuring efficiency. As part of the health reform initiative, preventative and procedural measures, such as colonoscopy, are considered a gateway to managing patient care more effectively. Considered the most effective screening and surveillance test for colorectal cancer (CRC), colonoscopy has been associated with a reduced mortality rate.[1-4] Colonoscopy, however, is a highly technical procedure with significant risks and complications (eg, loop formation) that can cause patient discomfort and increase expenses.[5,6] A successful colonoscopy depends on a number of variables, including patient- and disease-related factors, but particularly the clinician's expertise and the technology being used.[6-8]

In an effort to reduce variability, improve colonoscopy outcomes, and maximize efficiency, quality measures, including cecal intubation rate and adenoma detection rate (ADR), have been implemented.[1,3,7] In the future, these measures will be used to determine a clinician's level of reimbursement; success in achieving these quality measures will result in higher reimbursement, whereas failure to achieve these marks will subject clinicians to penalties.[1,9]

An assessment of the available technology for colonoscopy demonstrates the benefits of using devices that enhance visualization and control to improve outcomes. The Olympus EVIS EXERA III system offers clinicians advanced technology that optimizes visualization and maneuverability, while reducing patient discomfort using a new generation of innovative colonoscopes, along with ScopeGuide and the UCR Endoscopic CO_2 Regulation Unit.

This article reviews the use of the Olympus EVIS EXERA III system, ScopeGuide, and the UCR Endoscopic CO_2 Regulation Unit as an encompassing approach to meeting quality measures and improving the success rate of colonoscopy.

Essential Quality Measures

In 2006, the American College of Gastroenterology (ACG) and the American Society of Gastrointestinal Endoscopy (ASGE) formed a task force to develop quality indicators for endoscopy,[7,10] which were then incorporated into a voluntary reporting program known as the GI Quality Improvement Consortium, Ltd (GIQuIC).[11] This program is a quality metrics registry approved by the Centers for Medicare & Medicaid Services (CMS) and qualified by the Physician Quality Reporting System (PQRS). GIQuIC provides endoscopists with a mechanism to meet quality documentation standards to avoid future reimbursement penalties and adjustments.[1,9,12] The quality measures, including cecal intubation rate and ADR, for colonoscopy screening and surveillance are listed in Table 1.[11]

Cecal Intubation Rate

As the initiating point of a colonoscopy, cecal intubation refers to the complete passage of the colonoscope tip in the cecal caput with visualization of the medial wall between the appendiceal orifice and the ileocecal valve.[1,7] Cecal intubation improves overall sensitivity, eliminating the need for radiographic procedures or repeat colonoscopy, thus reducing associated costs.[7] According to the ACG/ASGE recommendations, clinicians should be able to achieve cecal intubation in at least 90% of all colonoscopies and 95% of screening colonoscopies.[9]

Adenoma Detection Rate

ADR is considered the benchmark quality indicator in colonoscopy and represents a gauge of an endoscopist's skill and care in visualizing the entire mucosa during a procedure.[3] Current guidelines indicate an expected ADR of at least 25% for men and at least 15% for women over the age of 50 years.[7] In a recent study of 314,872 colonoscopies, Corley and colleagues evaluated the relationship between ADR and risk for CRC.[13] Results showed that a 1% increase in ADR was associated with a 3% decrease in risk for CRC.[13] Implementation of these standards increases the likelihood of detecting neoplastic lesions in the colon, and further advances the benefit of universal considerations in screening and surveillance.

The Difficult Colonoscopy

The success of a colonoscopy ultimately depends on the anatomy and physiology of the colon.[6,7] To reach the cecum and achieve complete visualization of the entire colon, the scope must be extended through the colon, which is too flaccid to resist or redirect the force of insertion.[14] Even the most skilled clinicians experience difficulty preventing the scope from looping into unwanted positions. Stretching the colon may lessen control over the colonoscope, increasing the risk for looping and perforations.[6,15] The current standard of applying abdominal pressure and changing patient position is only minimally effective in resolving loops in a difficult colonoscopy.[6] Perforation is rarely caused by the tip of the scope, but instead occurs when pushing the scope to traverse a curvature that expands due to pressure from the scope to then split from the expanding colonoscope loop.[15] Because these types of tears are not located near the tip of the scope, they often are unnoticed until scope withdrawal.[15] Because looping and perforation can cause pain and discomfort during the procedure, enhanced visualization through the scope lens will enable clinicians to direct the scope with greater control and maneuverability.

Table 1. GIQuIC Quality Measures for Colonoscopy

1.	History and physical documentation
2.	Informed consent documentation
3.	Adequacy of bowel preparation
4.	Written discharge instructions for outpatients
5.	ASA category documentation
6.	Indication documentation
7.	Cecal intubation rate with photo documentation A. All colonoscopies—screening, surveillance, and diagnostic B. Screening
8.	Adenoma detection rate—screening A. Female B. Male
9.	Withdrawal time
10.	Immediate adverse events

ASA, American Society of Anesthesiologists; **GIQuIC,** GI Quality Improvement Consortium, Ltd

Based on reference 11.

Improving Visualization and Control in Colonoscopy

Innovations in technology have improved visualization and control capabilities during colonoscopy. The Olympus EVIS EXERA III system provides a foundation on which to add other devices to further enhance the clinical experience to achieve the quality measures while minimizing patient discomfort.

EVIS EXERA III

The Olympus EVIS EXERA III platform implements a set of standards that advances visualization, scope control, and workflow during colonoscopy. The EVIS EXERA III platform features Dual Focus, an innovative optical system consisting of adjustable optics that enhance resolving power and sharpness down to 2 mm—an advantage when examining tissue.[16]

With its proprietary Responsive Insertion Technology (RIT), the Olympus EVIS EXERA III system provides optimal scope control and maneuverability using 3 modalities—Passive Bending (PB), High Force Transmission (HFT), and Variable Stiffness.[16] Located between the tip and the first segment of the scope, the PB segment senses the change in pressure when the scope tip contacts the colon wall and bends automatically in the direction of the lumen, creating a gentle curve that allows the scope to pass flexures.[16] HFT enables a 1:1 transfer of pushing and rotating forces to the distal end of the scope, which improves the ergonomics and responsiveness of the scope.[16] Variable Stiffness allows the operator to modify the stiffness of the scope along its length, adjusting to the anatomy of each patient, and is helpful in reducing looping of the scope.[16]

A New Generation of Scopes

The availability of the Olympus 190-series colonoscopes further enhances the visualization and control capabilities that make colonoscopy more efficient. The depth of field is 5 to 100 mm in normal view and 2 to 6 mm in near view.[17] As part of the EVIS EXERA III system, the 190-series colonoscopes possess the 3 RIT modalities—PB, HFT, and Variable Stiffness—giving the clinician more control to maneuver while adjusting the rigidity of the scope as needed.[17]

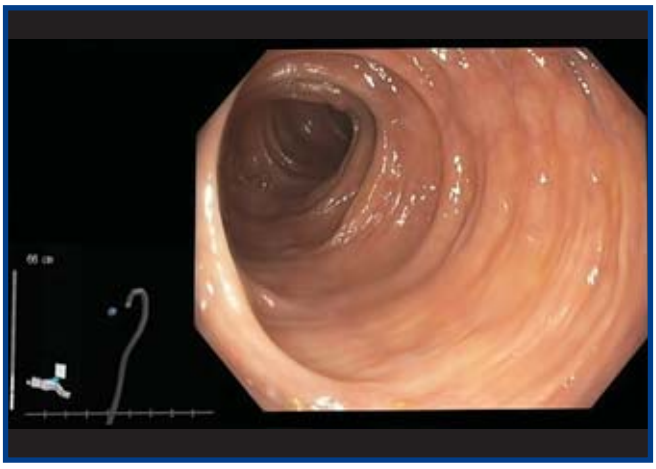

Figure 1. A ScopeGuide image.

Photo courtesy of Steven Lichtenstein, DO

ScopeGuide

The inclusion of ScopeGuide allows clinicians to observe the shape and position of the colonoscope inside the body in real time.[18] The 3-dimensional representation of the colonoscope is made possible by magnetic coils in the colonoscope that generate a pulsed, low-frequency magnetic field (Figure 1).[18] These magnetic pulses are transmitted to an external receiver and processor that create a representation of the colonoscope on a screen alongside the endoscopic image. The capability to visualize the scope allows the clinician to identify and mitigate loops as they form, and aids in identifying where to apply abdominal pressure, if necessary.[19] Additionally, clinicians can use ScopeGuide images for documentation and training.

Technology Improving Quality Measures

In addition to its visualization and scope control capabilities, the Olympus EVIS EXERA III system is able to streamline workflow, further maximizing efficiency and containing costs.

Cecal Intubation Rate

Recent research demonstrated faster intubation times using the Olympus EVIS EXERA III system 190-series colonoscope (CF-HQ190L) as compared to the 180-series instrument (CF-H180AL).[20] A post hoc analysis of 1,080 patients who participated in 2 clinical trials evaluated cecal intubation times using the 2 colonoscopes operated by 11 endoscopists with varying levels of experience.[20] The median and mean cecal intubation times for the 190-series scope were consistently shorter than the times using the 180-series instrument, regardless of the experiential level of the endoscopist (Table 2).[20] Results showed that 8 endoscopists had shorter cecal intubation times using the 190-series colonoscope with up to a 20% reduction in cecal intubation time.[20] As a primary quality indicator for colonoscopy, a high cecal intubation rate may indicate a more efficient procedure with less time spent repositioning the patient.[1]

With the addition of ScopeGuide, clinicians are able to improve cecal intubation time, as well as minimize the duration of looping. In a study of 44 patients with features or history indicating a difficult colonoscopy, results showed that using ScopeGuide reduced the cecal intubation time from 9.1 to 6.6 minutes, while the duration of looping was shorter (2.2 vs 4.3 minutes, respectively).[21] Although these results were not statistically significant with this sample size, the study demonstrated an improvement in patient comfort during a difficult colonoscopy.

Table 2. Cecal Intubation Time Versus Clinician Experience

Cecal Intubation Time, min	180 Series	190 Series	*P* Value[a]
Overall			
Mean±SD	6.0±4.0	5.3±3.5	0.0053
Median	5.0	4.0	0.0067
<5,000 colonoscopies			
Mean	6.7±4.4	6.2±4.2	0.3832
Median	6.0	5.0	0.2863
5,000-9,999 colonoscopies			
Mean	5.2±3.7	4.6±3.1	0.0591
Median	4.0	4.0	0.0878
>10,000 colonoscopies			
Mean	6.2±3.7	5.6±3.1	0.0753
Median	5.0	5.0	0.1184

SD, standard deviation

[a] The 2-sample *t* test was used to calculate *P* value for mean, and the nonparametric Wilcoxon-Mann-Whitney test was used to calculate the *P* value for the median.

Based on reference 20.

Adenoma Detection Rate

Instrument capability has been demonstrated to contribute significantly to ADR,[6] and several features of the Olympus EVIS EXERA III colonovideoscope (Olympus CF-HQ190L/I) improve visualization of the mucosal surface. As previously noted, Dual Focus, a unique innovation of the Olympus instrument, allows the observer to toggle between 2 focus settings (Figure 2).[17] This feature enables the endoscopist to quickly zoom in on any feature and back out to continue the examination. Additionally, the EVIS EXERA III platform has a new optical system that provides enhanced image quality, including a brighter image, increased contrast, and reduced noise and halation.[17] Finally, EVIS EXERA III has a photo documentation capability that enables the endoscopist to capture consistently sharp still images at near and normal foci.

A recent study demonstrated the visualization accuracy of the Olympus EVIS EXERA III colonovideoscope (Olympus CF-HQ190L/I) in detecting adenomas in patients with average risk.[22] In all, 600 patients participated in the study in which 927 polyps were examined by 6 endoscopists each with a different level of experience and number of procedures.[22] The ADR was 50% with the 190-series colonoscope.[22]

Reducing Patient Discomfort

Methods of reducing patient discomfort are important because preconceptions about pain may limit patient receptiveness for screening colonoscopies. Patients' negative perceptions can be changed, however, and several actions can be taken to make screening more comfortable.[23]

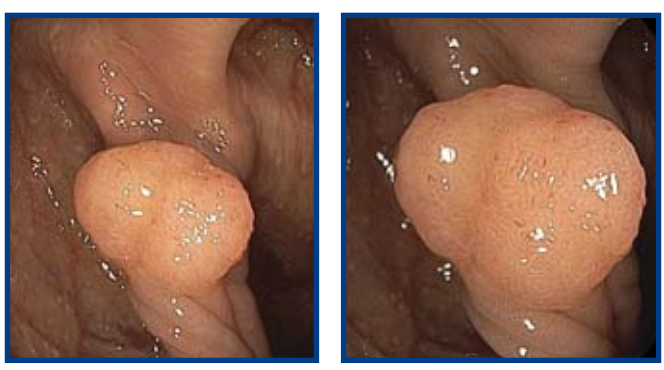

Figure 2. Photographs of a polyp: normal view (left) and near-focus view (right), using an Olympus EVIS EXERA III System colonoscope and Dual Focus.

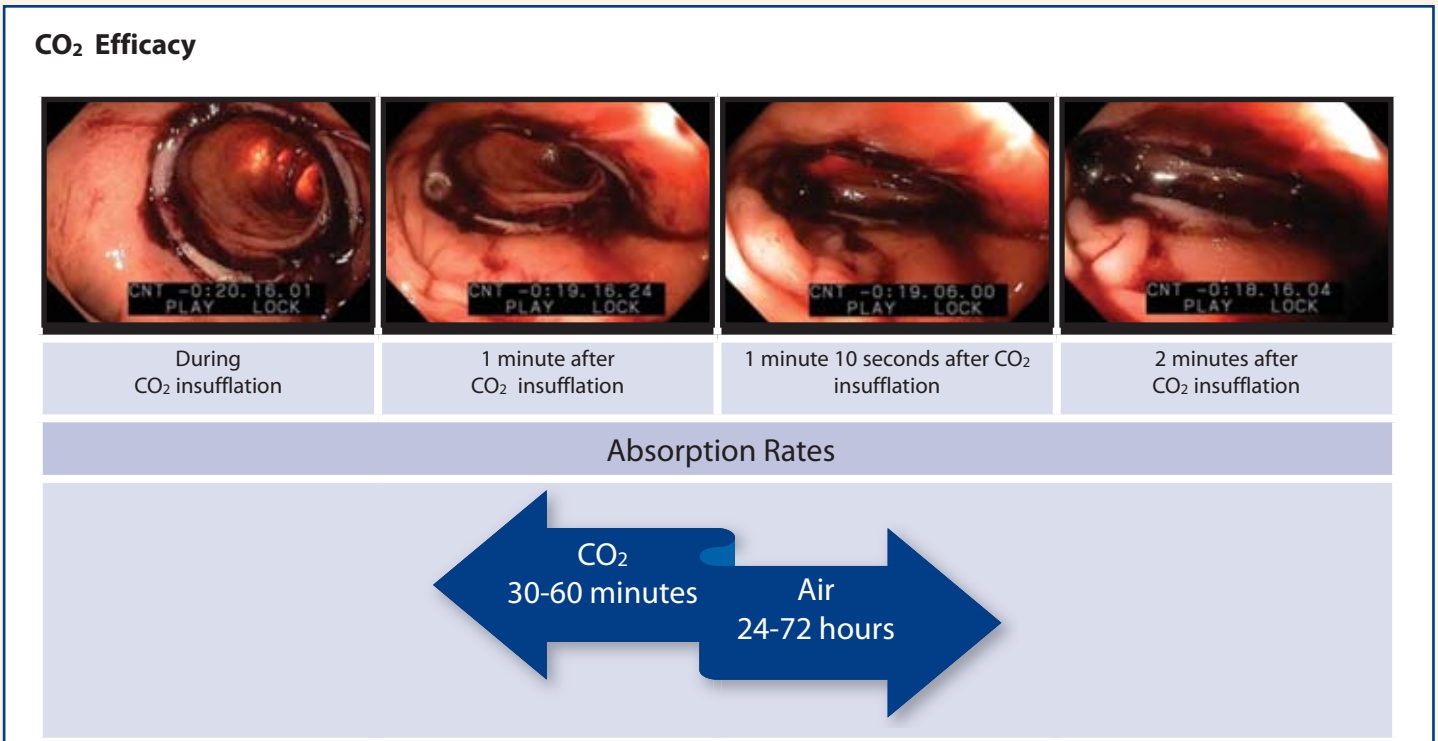

Figure 3. Colon distention during CO_2 insufflation.

Table 3. Mean Pain Scores During and After Colonoscopy Using Air or CO_2

Period During Colonoscopy	Air	CO_2	CO_2 Withdrawal	*P* Value
During procedure	4.55±1.98	4.69±2.34	4.56±2.32	0.957
At end of procedure	3.59±2.49	2.43±1.83	2.26±2.07	0.026
Postprocedure, 1 h	2.68±2.47	0.62±1.07	1.02±1.78	<0.001

Based on reference 30.

Colonoscopies that are more comfortable were found to promote patient compliance, and low discomfort scores were significantly associated with patient willingness to have a repeat procedure.[24] Using ScopeGuide as part of the EVIS EXERA III system, endoscopists are able to identify and mitigate loops more effectively, apply abdominal pressure more accurately, and visualize the anatomy better, thus reducing potential patient discomfort while making the procedure more efficient in terms of time to completion.[18]

UCR Endoscopic CO_2 Regulation Unit

Insufflation is required during colonoscopy to enable adequate visualization of the bowel.[23,25] Minimal insufflation can be used during insertion and withdrawal of the colonoscope to permit safe introduction, and to ensure optimal inspection of the colonic mucosa.[6] Thus, the ideal agent for colon expansion should be effective in facilitating cecal intubation and optimal examination of the mucosal surface, be safe and readily available, and minimize intra- and postprocedural pain.[25] Because carbon dioxide (CO_2) is absorbed faster than air, insufflation with CO_2 is a method that has been shown to reduce patient discomfort and pain without causing safety issues or significant costs (Figure 3).[23,25] Using the Olympus UCR Endoscopic CO_2 Regulation Unit, clinicians are able to apply intraluminal insufflation using CO_2 during colonoscopy to minimize bowel distention while reducing patient discomfort during and after colonoscopy.

Randomized controlled trials have consistently shown the benefit of CO_2 insufflation using the UCR Endoscopic CO_2 Regulation Unit.[26-28] Use of CO_2 instead of air for insufflation has been associated with reduced intra- and postprocedural pain and decreased postprocedural flatus.[26] The benefit of CO_2 insufflation also was observed in difficult colonoscopies.[29] In potentially difficult colonoscopies, patient-rated pain scores were significantly better in patients who received insufflation with CO_2 than air, predominantly in the 2-hour period immediately after the procedure.[29] Other research suggests that CO_2 insufflation could be restricted to the withdrawal phase only, with comparable results.[30] A prospective, single-blind, randomized controlled study of 100 patients with symptoms indicating the need for colonoscopy compared insufflation with air, CO_2, or CO_2 during the withdrawal phase only.[30] Patient discomfort was similar for CO_2 and air during the procedure, regardless of whether CO_2 was used for the whole procedure or only during withdrawal; however, it improved with CO_2 at the end of the procedure and 1 hour postprocedure (Table 3).[30] Whether used routinely or for potentially difficult cases, CO_2 insufflation benefited patients by reducing pain and discomfort. The CO_2 insufflation capability of the UCR Endoscopic CO_2 Regulation Unit provides minimal luminal distention, and has a selectable flow rate and compact design.

Conclusion

In providing safe and effective screening colonoscopies, quality and efficiency are vital issues. In the current health care environment, quality metrics are linked to professional standing and procedure reimbursement, and may soon be included in databases that will be available to patients. Many variables influence quality, and one of the most important is the technology used. Employing the EVIS EXERA III system for colonoscopies has several advantages. The instrumentation is easier to use given its improved flexibility and maneuverability. The unique advantage of being able to visualize the position and shape of the scope during the procedure provides clinicians with the ability to recognize instrument looping as it forms and correctly apply abdominal pressure as needed. The improved optics of the EVIS EXERA III system enhances polyp detection and documentation. Although not directly related to quality, CO_2 insufflation results in decreased patient pain during and after colonoscopy, and may promote increased patient compliance.

Evaluating New Technology in Clinical Practice

Olympus invited 5 physicians, Drs. Gross, Gorcey, Lichtenstein, Rastogi, and Stefan, to compare 190-series colonoscopes, ScopeGuide, and CO_2 insufflation versus the previous generation 180-series colonoscopes with the goal of understanding the effect of new technology in clinical practice. Each physician reviewed data from 50 cases conducted with a CF-HQ190L, ScopeGuide, and CO_2 insufflation and 50 cases conducted using a CF-H180AL. The following key data points were noted during the study review: time to cecum, ADR, mean adenomas per patient, required patient position changes to reach the cecum, the use of abdominal pressure, and length of stay in recovery. The interim results of the cases were combined and analyzed, and the results suggest that a more efficient and effective colonoscopy can be performed using 190-series scopes, ScopeGuide, and CO_2 insufflation.

Efficiency Case Study Results

Efficiency Case Study Attribute	190-Series Colonoscope, ScopeGuide, and CO_2 Insufflation	180-Series Colonoscope
Time to Cecum, min	4:33	5:03
Patients Requiring Abdominal Pressure, %	20.4	31.3
Patients Requiring Position Changes, %	4.0	8.0
Adenoma Detection Rate, %	45.9	42.5
Mean Adenomas per Patient	0.89	0.88
Patient Time in Recovery, min	38.5	43.7

A Roundtable Discussion

The following discussion was moderated by Seth A. Gross, MD, FACG, and provides clinical insights on the role of technology and the use of the Olympus EVIS EXERA III system.

Seth A. Gross, MD, FACG: For those of you who have worked with the 180-series colonoscopes and the 190-series colonoscopes, what are some key differences that you've appreciated that could potentially help your practice on any given day when you're doing colon cancer screening and surveillance?

Steven Lichtenstein, DO: I'm not through with the 180 patient arm yet, but I'm noticing early on that I'm applying a lot more abdominal pressure with the 180 scopes than I had to with the 190s. I think the Responsive Insertion Technology or just the maneuverability and the bending of the 190, the difference of the 190 responsiveness seems to get me to the cecum with minimal, if any, abdominal pressure. With the 180s, I've probably applied pressure in at least one-third of them.

Amit Rastogi, MD, FASGE: I think the flexibility and the torque ability of the scopes have improved. We actually performed a post hoc analysis of a prospective, randomized, controlled study that compared the 180-series colonoscopes to the 190-series colonoscopes for real-time actual polyp histology prediction. We looked at what the median time to reach the cecum was in 2 arms. Across 3 centers and more than 1,000 patients (500 in each arm), we found that the median time decreased by 1 minute. Now, it might not be a huge deal, but the median time to reach the cecum was 25% to 30% less with the 190-series colonoscopes. And this was in the hands of experienced endoscopists. So, how it will translate to less-experienced endoscopists or trainees remains to be seen, but it seems to be an advantage.

The other improvement that I saw was in the Narrow Band Imaging (NBI). The images are much brighter, and the illumination and the brightness is enhanced as compared with the 180-series. This was a major criticism of the 180 NBI, the image was very dark. The freeze-frame function, which helps us to take good images, is a huge difference.

Andreas M. Stefan, MD: We've been using the 190s for over a year in our ambulatory surgery center and have been extremely pleased with the performance of these scopes. This is due to multiple factors including the increase in field of view from 140 to 170 degrees and improved tip flexibility without compromising insertion force transmission. The expanded field of view makes retroflexion in the rectum almost redundant since you can see nearly 180 degrees at the tip. The flexibility of the new line is impressive. I have had the experience of not being able to navigate a sigmoid turn in a particularly thin patient with the 180 line, but was able to complete the exam using the 190 series. I think this is due to the Passive Bending section in the 190-series. Having said that, I have also found the new 190-series scope to hold its shape better once straightened. I'm using a scope stiffener far less often with the newer scopes.

Steven A. Gorcey, MD: I think that Dual Focus is one of the keys to the scope, not only as a diagnostic tool but also as a therapeutic tool. As we start getting into endoscopic mucosal resection (EMR) and endoscopic submucosal dissection (ESD), it's extremely important to see where the edge is of the lesion. Dual Focus is just an outstanding technology to delineate those edges before you start dissection.

Dr. Gross: I think we highlighted all of the key differences between the 180 and 190 and how—from all of the things you all said—they could certainly affect the quality of our exam and also potentially impact the efficiency. Do you think new technologies can aid physicians in meeting or exceeding the new colonoscopy standards like ADR? You've all probably heard that in the coming months those benchmarks that we all hold ourselves to (of 25% for men and 15% for women) are likely to increase. Where do you feel new technologies could affect some of these quality metrics like ADR?

Dr. Rastogi: For detection, I always talk about technique. Technique remains the mainstay, and if you have poor technique then no matter what technology you use it's not going to help. So technique pretty much stays the same no matter what scope you're using a lot. The torque ability probably helps the 190 because if there's a better transmission of your torque down the colonoscope then you basically can look at the proximal aspects of the fold better compared with when in a looped position the transmission is not that great as with the older versions of the scope. So that is one way this can help.

The other way technology has helped, based on some studies and some meta-analyses, is the high-definition feature. Both the 180 and 190 are high definition but if you look at technology, I think improving the definition of the scopes—moving over to the high-definition scopes—has improved the ADRs to a certain extent. There are a host of other technologies that can help to inspect the proximal aspects of the folds, and the one I like is cap-assisted colonoscopy because it's pretty inexpensive and very efficient. You put a cap at the end of the colonoscope and use the cap to flatten the folds. The proximal aspects of the folds are the blind areas where you usually miss the edges of the polyps, especially flat lesions.

Dr. Lichtenstein: More literature is coming out, and more people are talking about the ADRs and the quality measures that we'll be expecting over the next couple of years. Just that alone, I think, is going to hold most gastroenterologists to a higher level of picking up these polyps that may have once been missed. Having said that, the new technology, such as the 190 scopes with Dual Focus and with the improved NBI, is going to allow us to fulfill the requirements of acheiving higher adenoma detection rates. So the new technologies will be beneficial. I agree with Dr. Rastogi: If your technique is bad it's going to be bad straight through no matter what scope you're using. I agree with that about 90%. But I think for the talented endoscopists, we're going to be increasing our ADRs. I think the less talented endoscopists will need the new technology more so to perhaps improve the ADRs to a greater degree. So, I think just the awareness of what's coming down the pike with quality measures along with new technology, it's going to improve everyone's ADR to some extent, but probably a little bit more for the less talented endoscopists than for the higher-level endoscopists.

Dr. Gross: I think that a lot of these new technologies ultimately need to prove themselves. As many of you have echoed, technique is paramount, and I think just high-definition white light has really improved what we do. And I think we'll learn a lot more in the next 12 to 24 months about which of these enhancements to colonoscopy has staying power. But the technique will carry through for sure.

Dr. Gorcey: It's important to mention that no matter how good your technology is, if you don't have a good prep then you're not going to have the ADR. If your prep is not good, then you're not going to detect small polyps.

Dr. Gross: I think that's an excellent point. I imagine that most of you—if not all of us—are using a split-dose bowel prep of one formulation or another to try to get that high-quality bowel preparation.

How has ScopeGuide affected your practice? Additionally, where have you seen the benefits of using CO_2 insufflation for a colonoscopy?

Dr. Rastogi: I usually don't use ScopeGuide routinely in my clinical practice, but I've used it a few times in the past. Obviously, there is good data supporting its use, especially for trainees and less-experienced endoscopists. It has been shown to help the trainees and less-experienced endoscopists get to the cecum in a higher proportion of cases and requiring less assistance in the form of pressure or position change. CO_2 is something that I use, and I really like it. There is good level 1 evidence showing that it decreases intraprocedural as well as postprocedural pain with the most prominent effect at 1 hour post-procedure, which is the time when patients are waking up and basically are getting ready to be discharged, and you can't discharge them if they have pain.

Anecdotally in my unit, once we started using CO_2 on a regular basis, the nurses mentioned that the complaints from patients of abdominal distention and postprocedure pain dramatically decreased. So again, that was anecdotal, but that is something the nurses in the recovery area noted, that once we started using CO_2 on a more regular basis very few, if any, patients were complaining of abdominal discomfort at the end of the procedure when they were waking up from sedation.

Dr. Gorcey: We had ScopeGuide for about 6 months before anyone even tried it. And I was one of those guys who said I don't need ScopeGuide. One day I decided to try it on a patient who couldn't be done by someone else. I'm looking at it, and it's like having fluoro on the patient with your foot on the pedal the whole time. It was unbelievable. So I started using it, and again everything is hardwired at this point in our lives, and I think none of us really think when we scope. But to actually see what the scope is doing while we're doing it somehow clicked something in my head, and I started seeing where most of the loops usually occur. I started bringing the concept back to my surgery center where I don't have ScopeGuide. On the tougher cases I would start thinking "what would it have looked like on ScopeGuide?".

When I think back, it made me a better colonoscopist just by making that visual connection with what was already hardwired in my brain. Not only that but for localization of polyps; now I see a polyp, I take a picture, I switch the screen and I take a picture of the ScopeGuide image. Now I have a perfect marker of where the polyp was—which side of the flexure it was on—and I don't need to tattoo it. Let's say you get a surprise polyp, and you didn't tattoo it. Now at least, you have a marker. Additionally, on the tough cases where you need 2- and 3-point pressures, it speeds the case up from an hour down to 15 minutes to get to the cecum when you know where to put the hands, when you know where the loops are forming. So I think it's a great tool. I think it could help everyone. I use it to teach the residents; they pick it up much faster because they can see the loops. I think if you're a poor colonoscopist it's going to make you better, and if you're a really good colonoscopist it's going to give you added information that you never had before and make it that much more fulfilling for you.

Dr. Stefan: I would echo those comments. I initially thought I wouldn't use it much but what I have found is that loop formation and reduction can be quite subtle. Sometimes you're surprised that you can reduce a loop earlier rather than waiting. This has obvious implications for patient comfort during the procedure as well as total procedure time if you are continually struggling with a loop. I have also appreciated the ability to more exactly pinpoint where a lesion is using ScopeGuide. This is particularly helpful in describing lesions that are not endoscopically resectable.

In regard to using CO_2, it is clear that patients are more comfortable in the recovery area and there is less flatus being passed which can be a source of embarrassment for some.

Dr. Lichtenstein: I agree. I'm very conscious of removing most of the air that I put in, but there's always going to be some air pockets that we cannot remove. But most of the time my patients are fairly comfortable in the postanesthesia care unit because I'm conscious of removing the air. But I felt that after using the CO_2 it would not change my patient comfort outcomes because they released fairly quickly. But I think it has. I haven't seen anyone with gas pains after CO_2, so there is a benefit there.

Dr. Gross: Overall, CO_2 has helped colonoscopy and patient satisfaction in the postprocedure. ScopeGuide certainly has its benefits—not just for the physicians but also for the medical assistants and nurses to help better pinpoint the pressure. I think some physicians will benefit from it for every case, and some physicians will benefit from it on demand when they encounter really challenging colonoscopies. But I think it has tremendous added value. How can we deliver a quality colonoscopy in an increasingly efficiency-focused industry?

Dr. Rastogi: Basically, good bowel prep; high-definition colonoscopes, which means high-def scopes, high-def processor, and high-def monitor; good technique; and having some accessory tools to visualize the proximal aspects of the 170-degree fold, which is the 190-series scope that has a wider view or something like cap-assisted colonoscopy. But definitely use CO_2 for better patient satisfaction and shorter stay in the recovery area.

Dr. Gross: Lastly, I think many of us have already invested in the 190-series scopes and platform, but does the added investment of the 190-series scopes, ScopeGuide, and CO_2 result in increased efficiency and improved patient satisfaction?

Dr. Stefan: I'd have to say yes. I had a patient come in today for follow-up colonoscopy. On this occasion, we used a 190 pediatric scope with CO_2, and she felt so much better during and after the procedure. I think the new platform improves patient satisfaction and procedure quality.

Dr. Gorcey: When I keep my colonoscopy records, I mention whether or not it was as a difficult case. So what I've been doing is pulling the ones that I've said were very difficult over to the hospital to use ScopeGuide. I had 2 that I couldn't get through; 1 that I couldn't get through twice. And I got through both of them with ScopeGuide, and I don't think I would have been able to get through without it. When I add ScopeGuide, the ones identified as being really difficult were no longer difficult. But you could see why they might have been difficult because of the loops that were formed. I knew which rotational torsion to go in on. Anytime you do someone like that it's a risk. When you're looping like that in someone, and you know you're looping, but you're not sure exactly where, and you can't get the pressure, that's a risk. You're stretching, and it's amazing you don't even realize

how much you're stretching until you start seeing that splenic flexure start going up when it starts looping on ScopeGuide. Sometimes it goes right up to the chest, and then you know how you can give somebody a splenic hematoma. You don't realize these things.

Dr. Lichtenstein: We already mentioned patient satisfaction, I believe, and increased efficiency with time to cecum, but what this question doesn't address is the physician satisfaction. We all talk about patient satisfaction; we know that's important. But this is our livelihood and coming in every day and scoping 4 out of 5 days a week and doing 50 to 60 scopes a week you want to be happy with what you do, you want to enjoy what you do. And just by the CO_2, the 190, and ScopeGuide, I think it just makes everything so much more enjoyable, and a happy physician then leads to happy patients and it's passed along to the staff and residents. And I think that's huge yet rarely discussed, but I think it's something definitely worth mentioning.

References

1. Schoenfeld PS, Cohen J. Quality indicators for colorectal cancer screening for colonoscopy. *Tech Gastrointest Endosc*. 2013;15(2):59-68.
2. Levin B, Lieberamn DA, McFarland B, et al; American Cancer Society Colorectal Cancer Advisory Group; US Multi-Society Task Force; American College of Radiology Colon Cancer Committee. Screening and surveillance for the early detection of colorectal cancer and adenomatous polyps, 2008: a joint guideline from the American Cancer Society, the US Multi-Society Task Force on Colorectal Cancer, and the American College of Radiology. *CA Cancer J Clin*. 2008;58(3):130-160.
3. Millan MS, Gross P, Manilich E, et al. Adenoma detection rate: the real indicator of quality in colonoscopy. *Dis Colon Rectum*. 2008;51(8):1217-1220.
4. Zauber AG, Winawer SJ, O'Brien MJ, et al. Colonoscopic polypectomy and long-term prevention of colorectal-cancer deaths. *N Engl J Med*. 2012;366(8):687-696.
5. Brooker JC, Saunders BP, Shah SG, et al. A new Variable Stiffness colonoscope makes colonoscopy easier: a randomised controlled trial. *Gut*. 2000;46(6):801-805.
6. Witte TN, Enns R. The difficult colonoscopy. *Can J Gastroenterol*. 2007;21(8):487-490.
7. Rex DK, Petrini JL, Baron TH, et al; ASGE/ACG Taskforce on Quality in Endoscopy. Quality indicators for colonoscopy. *Am J Gastroenterol*. 2006;101(4):873-885.
8. Adler A, Wegscheider K, Lieberman D, et al. Factors determining the quality of screening colonoscopy: a prospective study on adenoma detection rates, from 12,134 examinations (Berlin colonoscopy project 3, BECOP-3). *Gut*. 2013;62(2):236-241.
9. Calderwood AH, Jacobson BC. Colonoscopy quality: metrics and implementation. *Gastroenterol Clin North Am*. 2013;42(3):599-618.
10. Rex DK, Petrini JL, Baron TH, et al. Quality indicators for colonoscopy. *Gastrointest Endosc*. 2006;63(4 suppl):S16-S28.
11. GI Quality Improvement Consortium, Ltd (GIQuIC). 2014. http://giquic.gi.org/index.asp. Accessed October 21, 2014.
12. CMS approves GIQuIC as PQRS Qualified Clinical Data Registry: Q&A with GIQuIC Director & President Dr. Irving Pike. *Becker's ASC Review.* 2014. http://www.beckersasc.com/gastroenterology-and-endoscopy/cms-approves-giquic-as-pqrs-qualified-clinical-data-registry-q-a-with-giquic-director-president-dr-irving-pike.html. Accessed October 20, 2014.
13. Corley DA, Jensen CD, Marks AR, et al. Adenoma detection rate and risk of colorectal cancer and death. *N Engl J Med*. 2014;370(14):1298-1306.
14. Loeve AJ, Fockens P, Breedveld P. Mechanical analysis of insertion problems and pain during colonoscopy: why highly skill-dependent colonoscopy routines are necessary in the first place... and how they may be avoided. *Can J Gastroenterol*. 2013;27(5):293-302.
15. Waye JD. Difficult colonoscopy. *Gastroenterol Hepatol*. 2013;9(10):676-678.
16. Olympus EVIS EVERA III. Olympus; 2014.
17. 190-Series Colonoscopes. Olympus; 2014.
18. ScopeGuide. Olympus; 2014.
19. ScopeGuide. http://medical.olympusamerica.com/technology/scopeguide. Accessed October 21, 2014.
20. Rastogi A, Kaltenbach T, Soetikno R, et al. Cecal intubation times with colonoscopies incorporating passive bending and high-force transmission technology: a multicenter randomized controlled trial. *Am J Gastroenterol*. 2013;108(suppl 1):1-2.
21. Ignjatovic A, Thomas-Gibson S, Suzuki N, et al. Does ScopeGuide improve caecal intubation? A randomised controlled trial. *Gut*. 2011;60(suppl 1):A191.
22. Wallace MB, Crook JE, Coe S, et al. Accuracy of in vivo colorectal polyp discrimination by using dual-focus high-definition narrow-band imaging colonoscopy. *Gastrointest Endosc*. 2014. [Epub ahead of print]
23. Trevisani L, Zelante A, Sartori S. Colonoscopy, pain and fears: Is it an indissoluble trinomial? *World J Gastrointest Endosc*. 2014;6(6):227-233.
24. Leung FW. Methods of reducing discomfort during colonoscopy. *Dig Dis Sci*. 2008; 53(6):1462-1467.
25. Maple JT, Banerjee S, Barth BA, et al; GE Technology Assessment Committee. Methods of luminal distention for colonoscopy. *Gastrointest Endosc*. 2013;77(4):519-525.
26. Yamano HO, Yoshikawa K, Kimura T, et al. Carbon dioxide insufflation for colonoscopy: evaluation of gas volume, abdominal pain, examination time and transcutaneous partial CO_2 pressure. *J Gastroenterol*. 2010;45(12):1235-1240.
27. Sumanac K, Zealley I, Fox BM, et al. Minimizing postcolonoscopy abdominal pain by using CO_2 insufflation: a prospective, randomized, double blind, controlled trial evaluating a new commercially available CO_2 delivery system. *Gastrointest Endosc*. 2002;56(2):190-194.
28. Bretthauer M, Lynge AB, Thilis-Evensen E, et al. Carbon dioxide insufflation in colonoscopy: safe and effective in sedated patients. *Endoscopy*. 2005;37(8):706-708.
29. Uraoka T, Kato J, Kuriyama M, et al. CO_2 insufflation for potentially difficult colonoscopies: efficacy when used by less experienced colonoscopists. *World J Gastrointest Endosc*. 2009;15(41):5186-5192.
30. Hsu WF, Sun MS, Lo HW, et al. Carbon dioxide insufflation during withdrawal of the colonoscope improved postprocedure discomfort: a prospective, randomized, controlled trial. *Kaohsiung J Med Sci*. 2012;28(5):265-269.

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