

Are gastroenterologists willing to implement imaging-guided surveillance for Barrett's esophagus? Results from a national survey

Authors

Anoop Appannagari¹, A. Samad Soudagar¹, Constance Pietrzak¹, Prateek Sharma², Neil Gupta¹

Institutions

¹ Loyola University Medical Center, Department of Gastroenterology, Maywood, Illinois, United States

² University of Kansas Medical Center, Department of Gastroenterology, Kansas City, Kansas, United States

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Corresponding author

Neil Gupta

2160 S. 1st Avenue,
Building 54, Room 167
Maywood, Illinois 60153
United States
Fax: 1-708-216-4113
negupta@lumc.edu

Introduction: The American Society for Gastrointestinal Endoscopy (ASGE) has published a Preservation and Incorporation of Valuable Endoscopic Innovations (PIVI) statement on incorporating an imaging-guided surveillance protocol to replace the current practice of four-quadrant biopsies every two centimeters for Barrett's esophagus (BE) surveillance. We sought to determine if current gastroenterologists would be willing to apply these changes to their practice and identify any barriers to implementation.

Methods: We collected data using surveys that were distributed at two national meetings and using a random selection process emailed surveys to members listed in the American Gastroenterological Association directory. Physicians from a variety of practice settings participated. Primary outcomes of our study included determining whether clinicians would be willing to accept an imaging-based surveillance protocol, their reasons for not doing so, and whether a financial incentive would be persuade them to implement the protocol. Continuous variables were reported as mean \pm standard deviation. Categori-

cal variables were summarized with percentages and 95% confidence intervals.

Results: Gastroenterologists (172) completed the survey; and 140 (81.4%) of them stated they would implemented the PIVI recommendations into practice. Using a multivariate analysis of the data, physicians who reported a financial incentive for submitting biopsy specimens to pathology were less likely to implement the PIVI recommendations. The two main barriers to implementation of the protocol were medical-legal and financial reasons. Of the 32 gastroenterologists who were not willing to implement the imaging-guided surveillance protocol, 20 (62.5%) stated that they would implement it if there were a financial incentive.

Discussion: The PIVI statement focuses on re-evaluating our current method of surveillance for BE. The results of our survey show that gastroenterologists may be willing to implement an imaging-guided surveillance program, but concerns regarding financial compensation and proper training in advanced imaging techniques remain.

Abbreviations

ASGE	American Society for Gastrointestinal Endoscopy
BE	Barrett's esophagus
EUS	endoscopic ultrasound
PIVI	Preservation and Incorporation of Valuable Endoscopic Innovations

Background

The American Society for Gastrointestinal Endoscopy (ASGE) recently published a Preservation and Incorporation of Valuable Endoscopic Innovations (PIVI) statement on using an imaging-guided surveillance protocol rather than the current

protocol of obtaining four-quadrant biopsies every two centimeters for diagnosis of Barrett's esophagus (BE) [1]. The PIVI statement was created to address important clinical questions and other issues related to endoscopic innovation. Endoscopic surveillance of BE falls into this category because the current protocol has many limitations and weaknesses. Distinguishing dysplasia and adenocarcinoma from non-dysplastic tissue can be difficult using standard white-light endoscopy. Moreover, it is difficult for clinicians to perform four-quadrant biopsies every two centimeters [2]. Abrams et al found that adherence to this regimen is accomplished in only 51% of patients and it is even more difficult with longer segments of BE [3]. Thus, the PIVI committee proposed a system utilizing advanced imaging tech-

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niques to create a more targeted protocol for performing biopsies to reduce the number of patients biopsied for non-dysplastic disease.

With the implementation of any new technology, an important factor to consider is the willingness of gastroenterologists to utilize and accept these technologies. Therefore, we aimed to determine whether gastrointestinal physicians would be willing to implement imaging-guided surveillance for BE and to identify potential barriers to implementation of this protocol in clinical practice.

Materials and methods

Survey method

Our data was collected using surveys that were distributed in two ways. First, we attended both Digestive Disease Week (DDW) 2013 and American College of Gastroenterology (ACG) 2013 meetings, two large, national meetings of gastroenterologists, and randomly distributed the survey to meeting participants. Second, we randomly contacted clinicians by email using addresses obtained from the American Gastroenterological Association directory to distribute the survey. The survey consisted of 14 questions that included yes/no questions, free response questions, and multiple choice questions. The survey was divided into two sections that included demographics and questions specifically related to the PIVI statement. If the clinicians were willing to participate, they responded by writing answers on the questionnaire (● Fig. 1).

Questionnaire

Demographic data were collected, including age, number of years in practice, clinical setting, size of the clinician's respective cities, board certification status in both gastroenterology and transplant hepatology, number of esophagogastroduodenoscopies performed for BE surveillance, their practice for specimen submission to pathology and whether a financial incentive was received for doing so, and their experience with advanced imaging. Regarding the PIVI statement, we specifically inquired about the clinician's awareness of the PIVI statement, their willingness to implement advanced imaging strategies, and their reasons for not implementing advanced imaging strategies into practice. The reasons for not doing implementing advanced imaging strategies that we proposed included the effort required for learning and/or using new imaging technologies, the lack of availability of new imaging technologies, the cost, the financial disincentive that arises in not sending BE biopsies to pathology, the medicolegal concerns, and other. Participants were allowed to choose multiple reasons. The questionnaire asked if clinicians would be willing to use new imaging technologies if a financial incentive was provided. If those clinicians answered "yes" or "more likely to do so," we asked them to specify dollar amounts; the choices were <\$50, \$51–\$100, \$101–\$150, \$150–\$200, and >\$201. We did not include any gastroenterology trainees as participants in the study. Primary outcomes of the study included the participant's willingness to accept an imaging-based surveillance protocol for BE, their reasons for not doing so, and whether a financial incentive would persuade them to implement an imaging-based surveillance protocol. The participant's responses to the questionnaire were entered into a software database (Microsoft Excel; Microsoft Corporation., Redmond, Washington, United States).

Statistical analysis

Continuous variables were reported as mean \pm standard deviation and categorical variables were summarized with percentages and 95% confidence intervals. Multivariate regression analyses were used to identify independent predictors for the following outcomes: awareness of the ASGE PIVI statement, willingness to implement imaging-guided surveillance of BE, and the amount of financial compensation perceived to be appropriate for performing imaging-guided surveillance of BE. Physician age, years in practice, practice setting (academic vs. private practice), city size, board certification in gastroenterology, board certification in transplant hepatology, current performance of endoscopic retrograde cholangiopancreatography and/or endoscopic ultrasound, current performance of clinical or basic science research, average number of esophagogastroduodenoscopies performed for BE surveillance per month, financial incentive for submitting biopsy specimens to pathology, and current use of advanced imaging technologies during esophagogastroduodenoscopy were included as potential predictor variables. A $P < 0.05$ was required for statistical significance. Analyses were performed using STATA/IC version 10.1 (StataCorp; College Station, Texas).

Results

Participant details

Gastroenterologists (172) completed the survey: 145 participants were contacted at national meetings (100% response rate) and 27 participants were contacted by email (3.9% response rate). ● Table 1 displays the characteristics of those who participated in the survey. The mean (SD) age of the participants was 46.6 (9.7) years and time in practice was 11.8 (9.3) years. Sixty-six respondents (38.4%) practiced in an academic setting while the others were in private practice. 28 (16.3%) reported having a financial incentive for submitting biopsy specimens to pathology such as having ownership in a pathology facility, and 94 (54.6%) reported that they currently used some form of advanced imaging (chromoendoscopy, electronic chromoendoscopy, confocal laser endomicroscopy, etc.) in their upper gastrointestinal endoscopy practice.

Awareness and implementation of imaging-guided surveillance of Barrett's esophagus

Of the 172 gastroenterologists who completed the survey, 95 (55.2%) of them stated they were aware of the ASGE PIVI statement proposing imaging-guided surveillance of BE. One-hundred forty (81.4%) of them stated they were willing to implement imaging-guided surveillance if an imaging technology met the PIVI threshold and if adequate training in such technology were available. Multivariate analysis of the data showed that participants who were board-certified in transplant hepatology were less likely to be aware of the ASGE PIVI statement on imaging-guided surveillance of BE (OR 0.26, 95%CI 0.07–0.88). In addition, physicians reporting a financial incentive for submitting biopsy specimens to pathology were less likely to be willing to implement the imaging-guided surveillance of BE (OR, 0.17; 95%CI 0.06–0.48). These were the only two independent predictors for awareness and willingness to implement imaging-guided surveillance of BE.

Thank you for participating in our survey about real-time imaging of Barrett's esophagus.

1. What is your age? _____ years
2. Are you currently board certified in gastroenterology?
 - _ Yes
 - _ No
3. Are you currently board certified in transplant hepatology?
 - _ Yes
 - _ No
4. Do you currently conduct clinical or basic science research?
 - _ Yes
 - _ No
5. Do you perform ERCP or EUS?
 - _ Yes
 - _ No
6. How long have you been a practicing gastroenterologist (in years)?

7. In what setting do you primarily practice?
 - _ Academics/University practice
 - _ Hospital employed private practice
 - _ Non-hospital employed private practice
8. In what size city do you currently practice (in terms of population size)?
 - _ <25,000
 - _ 25,000–250,000
 - _ >250,000–1,000,000,000
 - _ >1,000,000
9. On average, how many EGD for Barrett's surveillance do you perform in a month?
 - _ None
 - _ 0–5
 - _ 6–10
 - _ 11–15
 - _ >16
10. Which of the following imaging techniques do you currently use while performing EGD in your practice? (check all that apply)
 - _ Standard white light endoscopy (not high definition)
 - _ High definition white light endoscopy
 - _ Electronic chromoendoscopy (Narrow band imaging, I-scan, FICE, etc)
 - _ Chemical chromoendoscopy (methylene blue, acetic acid, indigo carmine, etc)
 - _ Confocal laser endomicroscopy
11. Do you currently have a financial incentive for submitting biopsy specimens for histopathology?
 - _ Yes
 - _ No

The ASGE recently published a PIVI (Preservation and Incorporation of Valuable Endoscopic Innovations) statement for imaging guided surveillance in Barrett's esophagus patients. They concluded that an endoscopic imaging-based surveillance test must have a sensitivity and specificity of at least 90% and 80%, respectively, in order to replace the current biopsy-based surveillance protocol.
12. Are you aware of this PIVI statement?
 - _ Yes
 - _ No
13. If new imaging technologies existed that met the PIVI performance thresholds and you were provided appropriate training, would you be willing to adopt this practice for Barrett's surveillance?
 - _ Yes
 - _ No

a. If no, what would be your reason for not doing so? (choose as many as apply)

 - _ Effort required for learning and/or using new imaging technologies
 - _ Lack of availability of new imaging technologies
 - _ Cost of new imaging technologies
 - _ Financial disincentive in not sending Barrett's biopsies to pathology
 - _ Medico-legal concerns regarding assigning incorrect grade of dysplasia without tissue biopsy
 - _ Other (please specify)
14. If financial incentive/reimbursement were provided to perform real-time advance imaging endoscopic surveillance without using the current standard 4-quadrant biopsy every 2 cm protocol, and this service was available in your practice, would you be willing to use new imaging technologies?
 - _ Yes
 - _ No

_ More likely to do so

a. If "yes" or "more likely to do so," how much financial incentive per patient would be appropriate?

 - _ > \$201
 - _ \$150–200
 - _ \$101–150
 - _ \$51–100
 - _ <\$50

Fig. 1 Reproduction of questionnaire used in this study.

Barriers to implementation

Of the 32 gastroenterologists who were unwilling to implement the imaging-guided surveillance of BE, 28 of them listed medical-legal concerns and 12 of them listed financial disincentives and/or the lack of financial incentives as barriers to implementing imaging-guided surveillance of BE. Twenty of these 32 gastroenterologists (62.5%) stated they would be willing to implement imaging-guided surveillance of BE if given a financial incentive to do so. Only 143 gastroenterologists (83%) who completed the survey provided information on how much financial incentive would be appropriate for performing an in vivo optical diagnosis of BE histology. Of these 143 gastroenterologists, the response was as follows: 14 (9.8%) <\$50, 14 (9.8%) \$51–\$100, 15 (10.5%)

\$101–\$150, 24 (16.8%) \$151–\$200, and 76 (53.1%) >\$201. Multivariate analysis of the data showed that physicians in academic practice (OR, 0.10; 95%CI 0.02–0.41) and those with longer durations in practice (OR, 0.84; 95%CI 0.72–0.99) were less likely to feel that \$200 or more was appropriate compensation for providing an in vivo optical diagnosis of BE histology.

Discussion

▼ This descriptive, cross-sectional observational study set out to determine the willingness of current gastrointestinal physicians to implement an imaging-based surveillance protocol for BE. Re-

	Academic practice (n = 66)	Private practice (n = 106)	P-value
Demographics			
Age, mean (SD), years	44.0 (9.5)	48.2 (9.5)	NS
Length of practice, mean (SD) years	9.5 (9.0)	13.3 (9.3)	NS
City population > 1,000,000, average (%)	37 (56%)	41 (39)	0.05
Non-imaging diagnostics performed/week, average (%)			
0 – 5	18 (27)	9 (8)	
6 – 10	33 (50)	40 (38)	<0.001
11 – 15	12 (18)	34 (32)	
>15	3 (5)	23 (22)	
Respondents, number (%)			
With access to			
Confocal laser endomicroscopy	30 (45)	16 (15)	<0.001
Electronic chromoendoscopy	45 (68)	44 (42)	0.001
Chemical chromoendoscopy	26 (39)	7 (7)	<0.001
High definition white light	59 (89)	97 (92)	NS
Aware of PIVI statement			
With financial incentives to use pathology lab	0 (0)	28 (26)	<0.001
Willing to use imaging-guided BE surveillance	64 (97)	76 (72)	<0.001
With financial incentive	54 (82)	93 (88)	NS
Preferred financial incentive			
> \$ 200	16 (31)	60 (67)	
\$ 100 – \$ 200	15 (29)	23 (25)	
< \$ 100	21 (40)	7 (8)	

Abbreviations: SD, standard deviation; NS, not statistically significant; PIVI, Preservation and Incorporation of Valuable Endoscopic Innovations; BE, Barrett's esophagus.

sult of surveys show that over 80% of gastroenterologists would be willing to implement an imaging-based surveillance protocol into their practice. Given the many problems with our current BE surveillance regimen, this result is not surprising and is encouraging. Advanced imaging techniques have been shown to be a superior to other methods in detecting cancer or dysplasia [4]. Quemseya et al. performed a meta-analysis of 14 relevant studies and found that advanced imaging techniques increased diagnosis of dysplasia/cancer by 34% [5]. Subgroup analysis showed an increase in both advanced imaging techniques analyzed (chromoendoscopy and virtual chromoendoscopy). Another study by Sharma et al. examined probe-based confocal laser endomicroscopy and found that when combined with high-definition white-light endoscopy the ability to detect neoplasia was improved [6]. No technologies currently available meet all of the PIVI thresholds. It is important to remember that high-quality endoscopic examination is important in implementing any imaging-based protocol.

Gastroenterologists surveyed gave medical-legal concerns as their primary reasons for not implementing an imaging-based BE surveillance protocol. It is possible that given the lack of adequate training in reading and applying advanced imaging techniques, gastroenterologists are concerned with the theoretical risk of misreading the imaging and potentially missing the diagnosis of a patient with high-grade dysplasia or cancer. Training programs would have to be implemented to instruct gastroenterologists in the imaging methods that meet the PIVI requirements. Training could involve video modules, shadowing experienced gastroenterologists, and hands-on training using both models and actual patients. Additional studies are needed to quantify how much training would be needed before a physician is deemed competent to apply these modalities in clinical practice. Guidelines specific to each type of advanced imaging technique, including optical electronic enhanced endoscopy, high resolution endoscopy with magnification, and dye-based image enhanced

endoscopy, would be needed. The kinds of documentation needed for pathology and imaging-guided surveillance are different. In the current system, pathologists review the biopsies and create a report, however, when using imaging-guided surveillance, the endoscopist will need to save high resolution images for documentation. Quality control is also a concern because pathologists currently have the ability to review slides with fellow pathologists for confirmation of findings. There will need to be a quality control mechanism for imaging-guided surveillance. We found that 40% of gastroenterologists stated that they would not implement an imaging-guided BE surveillance system into practice due to the lack of a financial incentive. In their current practices, physicians can bill for biopsies taken during BE surveillance, whereas there is no payment structure for "optical" biopsies obtained using advanced imaging techniques. Moreover, many gastroenterologists receive compensation for regular biopsies because they have a stake in the ownership of their pathology laboratories. If they implement imaging-guided BE surveillance, they would lose that source of revenue.

A regular biopsy and an optical biopsy share the same goal: to evaluate tissue for intestinal metaplasia, dysplasia, and malignancy. Multivariate analysis showed that physicians who currently receive a financial incentive for submitting tissues to pathology for analysis were less likely to be willing to implement imaging-guided BE surveillance. In addition, considerable time and effort are needed for the gastroenterologist to learn a new method; time that takes them away from clinical duties for which they receive compensation. Further, clinicians would be taking the responsibility and the liability of now born by pathologists, which is another reason many gastroenterologists feel there would be a need for additional financial compensation. Over one-half of the physicians who responded to the survey stated that they would want \$201 (the highest category given on the survey) for imaging-guided surveillance of BE. As expected, physicians at academic medical centers were less likely to feel that \$201 or more

Table 1 Characteristics of academic and private practice gastroenterologists surveyed.

was appropriate compensation for providing an imaging-guided diagnosis because compensation models differ between academic and private practices. The reimbursement for submitting a single sample to pathology (about \$70.00; that is, \$38.00 for the physician and \$32.00 for the laboratory fee) [7], it seems reasonable that clinicians would expect some level of compensation. Long-segment BE typically requires multiple samples be sent to pathology, an even stronger case can be made for providing compensation to gastroenterologists for their use of imaging-guided BE surveillance. Obviously, introducing any financial compensation will reduce the overall cost-effectiveness of an imaging-guided BE surveillance protocol. The advantages of the imaging-guided protocol must be weighed against reducing pathology costs and improving diagnostic accuracy. Future studies will be needed when a financial compensation model is in place for the gastroenterologists who use an imaging-guided BE surveillance protocol.

Limitations of this study include a limited sample size, the low response to emails, and the accuracy of survey answers, which can be an issue with any survey administered. Physicians at national meetings are often busy and surveys may have been filled out in haste with less than accurate answers provided. Physicians surveyed were also all gastroenterologists from the United States. Their views and opinions may differ from gastroenterologists around the world, and any comments on financial incentives would not necessarily apply to the international population of gastroenterologists. Our particular sample of gastroenterologists was over-represented by academic gastroenterologists with access to advanced imaging techniques. This may have imposed a sampling bias, however, one can also argue that these clinicians have the most experience using advanced imaging techniques and would be intimately aware of their drawbacks. In addition, the financial incentives may have been under-reported because physicians may not have felt comfortable disclosing that information.

The PIVI statement highlights the importance of re-thinking the current practice of surveillance for BE. Using a survey of gastroenterologists in a variety of practice settings, we found that 80% of them were willing to adopt an imaging-guided surveillance strategy for BE. Concerns among gastroenterologists include medical-legal issues and financial compensation. Strategies to address these concerns will be needed before imaging-guided BE surveillance is widespread.

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