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The Quality of Care for Medicare Patients With Peptic Ulcer Disease

Joshua J. Ofman, M.D., M.S.H.S., Jeff Etchason, M.D., William Alexander, M.D., M.P.H., Beth R. Stevens, M.S., Jeph Herrin, Ph.D., Charles Cangialose, Ph.D., David J. Ballard, M.D., Ph.D., Dale Bratzler, D.O., M.P.H., Kurtis S. Elward, M.D., M.P.H., Dawn FitzGerald, M.S., Joan Culpepper-Morgan, M.D., and Barry Marshall, M.D.

Cedars-Sinai Departments of Medicine and Health Services Research, and Zynx Health Inc., Los Angeles, California; Atlanta VA HSR&D, Atlanta, Georgia; The Kerr L. White Institute for Health Services Research, Decatur, Georgia; Emory University Center for Clinical Evaluation Sciences, Atlanta, Georgia; Colorado Foundation for Medical Care, Aurora, Colorado; Oklahoma Foundation for Medical Quality, Oklahoma City, Oklahoma; Virginia Health Quality Center, Richmond, Virginia; Georgia Medical Care Foundation, Atlanta, Georgia; Connecticut Peer Review Organization, Middletown, Connecticut; H. pylori *Research Laboratory, QEII Medical Center, Nedlands, Western Australia*

OBJECTIVE: The aim of this study was to examine quality of care for hospitalized Medicare beneficiaries with peptic ulcer disease.

METHODS: Collaborating with five Peer Review Organizations, we used 1995 Medicare claim files to select samples of inpatients with a principal diagnosis of peptic ulcer disease. Quality of care indicators developed by content experts included percentages for ulcer patients tested for *Helicobacter pylori* (*H. pylori*); biopsied patients who received tissue tests; *H. pylori*-positive patients who received appropriate therapy; and ulcer patients screened for preadmission nonsteroidal anti-inflammatory drug (NSAID) use and counseled about risks.

RESULTS: Of 2,644 patients eligible for medical record review, 56% were tested for *H. pylori*, and 73% of those testing positive were treated appropriately; 84% of patients with endoscopic biopsies received a tissue test for *H. pylori*; 74% of patients were screened for preadmission NSAID use, 24% had documented counseling of NSAID use, and only 2% had documented counseling on the ulcer risk of NSAID use. Statistically significant regional variation occurred in four of six quality indicators. Outpatient records were reviewed for 529 patients to document prior outpatient *H. pylori* in this population; only 2% (n = 12) were tested for *H. pylori* in the year before admission.

CONCLUSIONS: Opportunities exist to improve quality of care by testing for and treating *H. pylori* in hospitalized Medicare beneficiaries with peptic ulcer disease and to improve screening for NSAIDs and counseling on ulcer risks. (Am J Gastroenterol 2000;95:106–113. © 2000 by Am. Coll. of Gastroenterology)

INTRODUCTION

Peptic ulcer disease is one of the most common disorders affecting the gastrointestinal system. The lifetime cumulative incidence of peptic ulcer disease is >10%, with an age-related peak in prevalence occurring between age 65 and 74 yr (1). Approximately 600,000 individuals are discharged each year from a U.S. hospital with a diagnosis of peptic ulcer disease (2). In 50% of these discharges, peptic ulcer disease was the primary diagnosis, resulting in an average length of stay that approached 7 days per patient in 1987 (3). The direct costs of diagnosis and treatment and the indirect costs of lost work time and productivity due to peptic ulcer disease account for $5–6 billion annually (4, 5). Nonsteroidal anti-inflammatory drug (NSAID) use has been identified as the cause of nearly 50% of ulcers occurring in the Medicare population (6, 7), and these patients are at increased risk of ulcer complications such as bleeding or perforation (8).

A new understanding of the role of *Helicobacter pylori* (*H. pylori*) in the pathogenesis of peptic ulcer disease has brought about a revolution in ulcer therapy. *H. pylori* is a spiral Gram-negative rod that causes chronic superficial gastritis (9) and 90–95% of duodenal and 70–90% of gastric ulcers not attributable to NSAIDs (10, 11). Because cure of *H. pylori* infection in ulcer patients results in symptom resolution, rapid ulcer healing, low recurrence rates, and improved quality of life (12, 13), a 1994 National Institutes of Health (NIH) Consensus Development Conference recommended that *H. pylori*-infected patients with documented ulcers be treated with anti-*H. pylori* regimens containing antibiotics (10).

As economic constraints on the health care system have increased, so has the imperative to provide cost-effective, high quality care. Quality of care measurements have tra-

ditionally relied upon the link between the processes of care and outcomes of care. Process measurements are often more sensitive measures of quality, as patients may have good outcomes despite poor care (14–16).

A paradigm shift in the management of peptic ulcer disease prompted the Health Care Financing Administration (HCFA) to promote activities aimed at improving the quality of care delivered to Medicare beneficiaries. In response to this directive, and as part of HCFA's Health Care Quality Improvement Program (HCQIP), a peptic ulcer disease study was developed by five peer review organizations (PROs): Colorado Foundation for Medical Care (CFMC), Connecticut Peer Review Organization (CPRO), Georgia Medical Care Foundation (GMCF), Oklahoma Foundation for Medical Quality (OFMQ), and Virginia Health Quality Center (VHQC). The goals of the study, developed under the leadership of CFMC, were 1) to assess the current practice of testing for and treating *H. pylori* relative to the 1994 NIH peptic ulcer disease guidelines; 2) to assess the current practice of screening for and counseling about the risks of NSAID use; and 3) to increase compliance with NIH guidelines through the HCFA HCQIP. The basic HCQIP process is to 1) assess current practice, 2) provide feedback regarding current practice to practitioners, 3) implement improvement plans, and 4) remeasure practice. Using information obtained from review of the hospital records of 2621 Medicare beneficiaries, the PROs measured the compliance with NIH guidelines for the detection and treatment of *H. pylori* in peptic ulcer disease.

MATERIALS AND METHODS

Sample

Each PRO used 1995 Medicare claims files from January 1, 1995, to June 30, 1995, to select a 100% statewide sample of patients with discharge diagnoses of peptic ulcer disease. Records were sampled in reverse chronological order from June 30, 1995, until 550 records were accumulated (the number needed to meet the power requirements of the planned analysis). The selection criteria were: age $\geq$65 yr and primary diagnosis of peptic ulcer disease (ICD-9 codes 531–534). Patients were excluded from review and analysis if they left the hospital against medical advice, were transferred to another hospital, or died, or if the diagnosis of peptic ulcer disease was not substantiated on medical record review.

To explore the question as to whether hospitalized patients received *H. pylori* testing on an outpatient basis before hospitalization, the outpatient claims for the year before hospitalization were reviewed for all 529 hospitalized patients from Virginia. The hospitalizations occurred between January 1, 1995, and June 30, 1995, and the outpatient claims were for the period January 1, 1994, to June 30, 1995.

Quality Indicator Development

The five PROs conducted preliminary studies of the diagnosis and management of *H. pylori*-related peptic ulcer disease. CFMC conducted a nonrandom chart review of 12 Medicare patients with ulcer complications (bleeding and or perforation) admitted during late 1994 and early 1995. The review found that none of the patients had been tested or treated for *H. pylori* infection. Additionally, VHQC conducted an on-line review of the hospital records of 20 Medicare patients admitted to hospitals in 1995 with peptic ulcers. As part of a Medical Quality Information System (MQIS) gastrointestinal module development, the Alabama Quality Assurance Foundation (AQAF) and the Iowa Peer Review Organization each conducted chart reviews on $>$120 Medicare admissions in 1995 with gastrointestinal bleeding principally caused by peptic ulcer disease and/or NSAID use. These pilot data revealed that 50–67% of patients were not tested for *H. pylori* and that 30–55% were not screened for NSAID use. Based on these findings, a multistate study group was assembled to review the preliminary data and develop the following quality of care indicators. The quality of care indicators for inpatient Medicare beneficiaries with a principal diagnosis of peptic ulcer disease were as follows:

1. *H. pylori* testing—The percentage of patients with peptic ulcer disease who were tested for *H. pylori*. Testing methods were defined as serology, carbon-labeled breath test, gastric antral biopsy with urease test, or culture or histology.
2. *H. pylori* tissue testing—The percentage of patients with peptic ulcer disease who underwent endoscopy with biopsy and received a tissue test (urease test, histology, or culture) for *H. pylori*.
3. Patients treated after a positive *H. pylori* test—The percentage of patients with peptic ulcer disease with positive results on *H. pylori* testing who were treated for *H. pylori*. Anti-*H. pylori* treatment was defined as treatment with combination regimens based on the following drugs: bismuth (B), amoxicillin (A), metronidazole (M), tetracycline (T), clarithromycin (C), omeprazole (O), ranitidine (R). Anti-*H. pylori* regimens were defined as one of the following combinations: BMT, BMA, BTC, BAC, MAR, CAR, AOC, MOC, MAO, OA, and OC.
4. Screening for preadmission NSAID use—The percentage of patients with peptic ulcer disease who were screened for preadmission NSAID use. The NSAID had to be listed as a preadmission medication, or there had to be documentation specific to the use or nonuse of NSAIDs before admission.
5. NSAID counseling—The percentage of patients with peptic ulcer disease who were counseled about NSAID use.
6. NSAID ulcer risk counseling—The percentage of patients who were counseled specifically about the ulcer risks associated with NSAID use.

Table 1. Summary of Demographic and Comorbidity Information for Hospitalized Medicare Patients With a Principal Diagnosis of Peptic Ulcer Disease, 1994–1995

	Colorado	Connecticut	Georgia	Oklahoma	Virginia	Multi-State
Charts analyzed	503	535	507	549	529	2621
Median age	78	78	76	79	78	78
10th to 90th percentiles	(68–89)	(69–89)	(67–88)	(69–89)	(68–88)	(68–89)
Gender						
% Male	43%	50%	42%	39%	43%	43%
Race:						
White	90%	95%	80%	94%	82%	88%
Black	2%	3%	19%	4%	17%	9%
Other	3%	1%	0%	2%	1%	1%
Unknown	4%	1%	1%	0%	1%	1%
Median length of stay	5	6	5	6	6	6
10th to 90th percentiles	(3–11)	(4–16)	(3–12)	(3–12)	(3–15)	(3–13)
Comorbidities						
HIV/AIDS	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hepatic failure	0.2%	0.6%	0.0%	0.2%	0.0%	0.2%
Leukemia/lymphoma/MALT	0.2%	1.1%	0.2%	1.3%	2.1%	1.0%
Metastatic cancer	1.4%	2.2%	1.1%	0.7%	2.3%	1.6%
GI cancer	4.2%	5.1%	1.9%	4.6%	3.4%	3.8%
Immuno-suppression	6.2%	5.5%	3.0%	8.0%	3.4%	5.2%
Cirrhosis	1.4%	2.8%	2.1%	1.1%	1.5%	1.8%
Zollinger-Ellison syndrome	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%

Data Sources and Collection Methods

CFMC team members developed a chart abstraction instrument that was modified for use in this multistate project, based on the recommendations of the multistate study group, nurse reviewers, clinical coordinators, and individual PROs' abstraction experiences. A final electronic version of the chart abstraction instrument was then developed by the CFMC Information Technology staff. CFMC trained abstractors from participating PROs in the use of this instrument, according to a previously used abstractor training protocol.

The lead abstractor from each state participated in a formal interstate interrater reliability assessment. A stratified sample of 35 records was used for the interrater reliability assessment. The Institute distributed the records to the PROs for abstraction. Each PRO was responsible for conducting its own internal reliability assessment according to a standard protocol.

Power Calculations

The power calculation was based on detecting a 10% difference in *H. pylori* testing rates before and after the implementation of this Health Care Quality Improvement Program (HCQIP) project. Using an alpha level of 0.05, a beta level of 0.20 (two tailed test), and assuming independent binomial proportions, it was determined that 408 abstracted charts were required at baseline; therefore, 550 charts were requested at baseline from each of the five PROs to obtain the required sample size.

Data Analysis

Medical record data abstracted by PROs were entered into a database using a software instrument (written in Paradox for Windows, Borland, 1994, Scotts Valley, CA) developed by CFMC. Statistical analysis software (Stata V.4, College Station, TX) was used for analysis. Interstate variation was assessed on each quality indicator using Pearson's χ^2 test.

RESULTS

A total of 2,773 charts were selected, of which 129 failed to meet inclusion criteria prior to review, leaving the medical records of 2644 Medicare beneficiaries for review and analysis. The patients' median age was 78 yr, and 43% were

Table 2. Performance on Quality Indicators for Management of Peptic Ulcer Disease in Hospitalized Medicare Patients, 1994–1995

Quality Indicator	Multistate* (Mean Rate)	Multistate (Range)
Percentage of patients tested for *H. pylori*	57%	50–67%
Percentage of patients with a biopsy performed who received a tissue test	84%	79–86%
Percentage of patients testing positive for *H. pylori* treated with anti-*H. pylori* therapy	73%	69–77%
Percentage of patients tested for preadmission NSAID use	74%	63–82%
Percentage of patients counseled about NSAID use	24%	16–30%
Percentage of patients counseled about the ulcer risks associated with NSAID use	2%	1–4%
Percentage of patients tested as outpatients in 12 months before hospitalization	2%†	N/A†

* Colorado, Connecticut, Georgia, Oklahoma, and Virginia.
† n = 529; review of Virginia cases only.

male; median length of stay was 6 days. Additional demographic characteristics and comorbidities of the patients are displayed by state in Table 1. A total of 35 charts were used for interrater reliability assessment of nine critical variables. The kappa values for these variables ranged from 0.63 to 0.98, with a mean of 0.81.

Testing for *H. pylori* before hospitalization, during hospitalization, or planned after hospital discharge was documented in 1505 (57%) hospitalized patients with peptic ulcer disease (Table 2). Of these 1505 patients, 1436 patients were tested during the hospitalization, 34 patients were tested before hospitalization, and 35 patients had testing planned postdischarge. For the 529 hospitalized patients from Virginia, only 12 (2%) had documentation of *H. pylori* testing as an outpatient in the year before hospitalization.

The most common diagnostic test for *H. pylori* was urease testing of biopsy specimens (59%), followed by histology, serology, and culture (Table 3). Of the patients who had endoscopic biopsies taken, 84% received diagnostic tissue testing for *H. pylori* (Table 2), 5% were tested by other means (serum antibody test), and 12% were not tested for *H. pylori*.

In the multistate sample, 1470 patients were tested for *H. pylori* infection before or during the hospitalization, and 472 (31%) tested positive. Of the 472 *H. pylori*-positive patients, 346 (73%) were treated for *H. pylori* during the hospitalization or had treatment planned upon discharge (Table 2). Thus, up to 27% of patients hospitalized with peptic ulcer disease and *H. pylori* infection went untreated. For the purposes of this analysis, we defined empiric treatment as treatment of patients who either 1) were not tested, 2) were tested but the results were not available at the time of treatment, or 3) were tested but were *H. pylori*-negative. There were 541 patients treated for *H. pylori*: 72 (13%) were not tested, 85 (16%) were treated without the test results known by the provider, and 38 (7%) were *H. pylori*-negative (Table 4).

According to medical record review, 1958 (74%) patients were screened for preadmission NSAID use (Table 5). NSAID use was defined as use within 4 wk before admission, during hospitalization, or at the time of discharge from the hospital; 1,683 (64%) cases screened positive for NSAID use. Patients who screened positive for NSAID use were more likely to be tested for *H. pylori* than those who screened negative for NSAID use (58% *vs* 51%; $\chi^2 = 13.0$; $p < 0.0001$). Of the patients tested, those who screened negative for NSAID use were more likely to be *H. pylori*-positive than those who screened positive for NSAID use (37% *vs* 30%; $\chi^2 = 8.5$; $p = 0.003$) (Table 6). Of the patients, 24% had documentation of receiving counseling regarding NSAID use, but only 2% had documentation of receiving specific counseling regarding the ulcer risks associated with NSAID use (Table 2).

Regional variation in the process of care was assessed for each quality indicator. There was statistically significant regional variation for four of the six quality indicators: *H. pylori* testing, screening for NSAID use, counseling about NSAID use, and ulcer risks associated with NSAID use. Statistically significant regional variation was not detected for *H. pylori* treatment and tissue testing of biopsy specimens (Table 5).

Table 3. Methods for *H. pylori* Testing in Hospitalized Medicare Patients (n = 1661) With a Principal Diagnosis of Peptic Ulcer Disease, 1994–1995

Test	Multistate* (Mean Rate)	Multistate (Range)
Serology	13%	5–22%
Breath Test	0%	0–0%
Urease Test on Biopsy	59%	49–70%
Culture	3%	0–8%
Histology	35%	20–51%
Unknown	5%	2–12%

* Colorado, Connecticut, Georgia, Oklahoma, and Virginia.

Table 4. The *H. pylori* Status of Hospitalized Medicare Patients (n = 541) With a Principal Diagnosis of Peptic Ulcer Disease Who Were Treated for *H. pylori*, 1994–1995

	Multistate* (Mean Rate)	Multistate (Range of State Means)
H. pylori-positive	64%	48–74%
H. pylori-negative	7%	3–10%
Tested for *H. pylori*, results unknown at time of treatment	16%	13–18%
Not tested for *H. pylori*	13%	7–27%

* Colorado, Connecticut, Georgia, Oklahoma, and Virginia.

DISCUSSION

In this study, only 57% of hospitalized Medicare patients with peptic ulcer disease were tested for *H. pylori*, and only 74% of patients known to be infected were treated with appropriate anti-*H. pylori* therapy. There is strong evidence from the review of the outpatient claims for the cases in Virginia that the overwhelming majority of patients (98%) are not tested for *H. pylori* before hospitalization. Additionally, although medical record review indicates that 74% of patients were screened for NSAID use, only 24% of patients with peptic ulcer disease had documentation of counseling regarding the risks of NSAIDs, and only 2% had documentation of counseling regarding the ulcer risks associated with NSAIDs. There was significant regional variation in the process of care in four of the six quality indicators (Table 5). Because these results are based on chart review, it is important to acknowledge that these patients may have been tested and counseled without these practices being appropriately documented in the chart. It may be that actual care is better than documented care in conforming to quality guidelines. This being noted, the only evidence available to describe current practice is that which is documented in the medical record.

Table 5. State-to-State Variation in Performance on Quality Indicators for Treatment of Peptic Ulcer Disease in Hospitalized Medicare Patients, 1994–1995

Quality Indicator	Multistate* (Range)	Pearson χ^2	*p* Value
Percentage of patients tested for *H. pylori*.	50%–67%	40.43	<0.0001
Percentage of patients with a biopsy performed who received a tissue test (urease culture or histology) for *H. pylori*	79%–86%	6.84	0.14
Percentage of patients testing positive for *H. pylori* treated with anti-*H. pylori* therapy	69%–77%	1.48	0.83
Percentage of patients tested for preadmission NSAID use.	63%–82%	74.06	<0.0001
Percentage of patients counseled about NSAID use	16%–30%	32.28	<0.0001
Percentage of patients counseled about the ulcer risks associated with NSAID use	1%–4%	16.70	<0.01

* Colorado, Connecticut, Georgia, Oklahoma, and Virginia.

This multistate Health Care Quality Improvement Project (HCQIP) of 2644 Medicare beneficiaries represents the largest study to date on the quality of care delivered to patients with peptic ulcer disease. The NIH Consensus Development Conference in 1994 stated that patients with ulcers should be tested for *H. pylori* and treated if test results are positive. The benefits of curing *H. pylori* infection include a dramatic reduction in ulcer recurrence rates and improved quality of life (12, 13). Inasmuch as the Medicare population is particularly vulnerable to complications of peptic ulcer disease, *H. pylori* testing and treatment has the potential to alter significantly the disease course and medical resource use in an elderly population. Additionally, because Medicare patients are at high risk for ulcer complications due to NSAIDs, specific counseling regarding ulcer risks has the potential to reduce morbidity in this population of patients.

Despite recent advances in the diagnosis and treatment of peptic ulcer disease, the results of our study suggest that the quality of care received by elderly patients with ulcer and ulcer-like symptoms remains less than optimal. The results of a survey mailed to 1119 physicians revealed that, although adoption of anti-*H. pylori* therapy was nearly universal among gastroenterologists in 1994, approximately one-third of primary care providers had never prescribed anti-*H. pylori* therapy for peptic ulcer disease (17). Surprisingly, only 59% of primary care providers believed that the strength of the association between *H. pylori* and duodenal ulcer was strong (18).

A random sample of 600 Medicare beneficiaries in California hospitalized in 1994 for peptic ulcer disease revealed that only 39% of patients with peptic ulcer disease were tested for *H. pylori*. Moreover, 43% of tested patients were *H. pylori*-positive, but only 47% of those patients were treated with antibiotics, and 3% of patients were treated without *H. pylori* testing. As in our study, 10% of *H. pylori*-negative patients were treated with antibiotics. In contrast to our findings, the rate of *H. pylori* testing in the California study was similar in patients with and without recent NSAID use (19). This study, however, evaluated patients hospitalized in the same year that the NIH guidelines were published; thus, the findings may be confounded by the fact that the guidelines may not have had enough time for proper dissemination.

Our multistate analysis, which was performed 1 yr after the guidelines were disseminated, reveals that only 56% of hospitalized Medicare beneficiaries with a discharge diagnosis of peptic ulcer disease were tested for *H. pylori* and only 2% appeared to have been tested in the outpatient setting. One explanation for persistent noncompliance with national guidelines regarding *H. pylori* testing is that physicians treated patients empirically with anti-*H. pylori* therapy. Of the 541 patients who received treatment for *H. pylori*, 195 (36%) were treated empirically. A total of 157 patients (29%) were treated without being tested or with unknown results, and 37 (7%) were treated despite a negative test.

There are a number of factors that may influence the rate of *H. pylori* testing or empiric anti-*H. pylori* therapy in patients with peptic ulcer disease. Because of the high pretest probability of *H. pylori* infection in patients with duodenal ulcer (90–95%), empiric anti-*H. pylori* therapy in patients with duodenal ulcer may be a cost-effective approach (20, 21). Furthermore, 7–10% of patients with peptic ulcer disease who are treated with antibiotics are negative

Table 6. Contingency Table for NSAID Use and *H. pylori* Testing for Hospitalized Medicare Patients in Colorado, Connecticut, Georgia, Oklahoma, and Virginia With a Principal Diagnosis of Peptic Ulcer Disease, 1994–1995

	Tested for *H. pylori*			
NSAID use	Positive	Negative or Unknown	Not Tested for *H. pylori*	Totals
Yes	290	690	703*	1683
No	182†	308	471	961
Total	472	998	1174	2644

* Patients screened positive for NSAID use were more likely to be tested for *H. pylori* than those screened negative for NSAID use (58% *vs* 51%; $\chi^2 = 13.0$; $p < 0.0005$).

† Of patients tested, those screened negative for NSAID use were significantly more likely to be *H. pylori*-positive than those screened positive for NSAID use (37% vs 30%; $\chi^2 = 8.5$; $p < 0.01$).

for *H. pylori* by conventional testing methods. Assuming that the prevalence of *H. pylori* infection in duodenal ulcer is 90–95%, a test with 90–95% sensitivity and specificity has a negative predictive value of only 50–68%. In other words, one-third to one-half of patients who test negative may actually be infected. Therefore, in the presence of an active duodenal ulcer, a negative *H. pylori* test is not reliable, and empirically treating peptic ulcer disease is a rational strategy in the absence of more sensitive tests (22). Despite the rationale for empiric therapy, these factors cannot account for the 1174 (44%) patients hospitalized with peptic ulcer disease who were not tested for *H. pylori*.

The percentage of positive tests for *H. pylori* in our study population was 32% (472 of 1470), a sizably lower percentage than that reported in the literature (23). There are a number of factors that may contribute to such a low prevalence of *H. pylori* in our sample. First, some patients may have a discharge diagnosis of peptic ulcer, site unspecified (ICD-9 code 533), yet may not have had peptic ulcer disease. Second, if patients with chronic peptic ulcer disease had recently been treated with bismuth, antibiotics, or proton pump inhibitors, then *H. pylori* may have been suppressed, leading to false-negative tests at the time of admission (22). Third, although patients presenting with NSAID-related ulcers have been shown to have lower rates of *H. pylori* infection (24), those screening positive for NSAID use in our study sample were tested more frequently than those screening negative. Thus, patients most likely to be infected were least likely to be tested (Table 6). Fourth, urease testing of biopsy specimens was the most common test used. When two biopsy specimens are obtained, urease testing has a sensitivity and specificity of 90% and 100%, respectively (25, 26). However, in our study, only 84% of patients who had biopsies taken actually had a tissue test performed. This may have resulted in underestimating the true prevalence of *H. pylori* in our sample. As we did not collect data on the number of biopsies obtained, the biopsy location (gastric antrum or body), or the institutional test characteristics, it is not known whether these factors contributed to the low observed prevalence of *H. pylori* in this study sample. Finally, patients with bleeding ulcers have a 15–20% lower rate of *H. pylori* infection than those with nonbleeding ulcers (27), but it is not known how many patients with a discharge diagnosis of peptic ulcer disease in this sample had active gastrointestinal hemorrhage.

In this multistate sample, 74% of patients who tested positive for *H. pylori* were treated with anti-*H. pylori* therapy. There are a number of possible explanations as to why patients known to be infected may not have been treated. First, it is possible that treatment plans were not documented in the medical records. Second, patients who 1) take NSAIDs and 2) are infected with *H. pylori* may present a dilemma to clinicians because the interaction between these two risk factors for peptic ulcer disease is unclear (7, 28–31). A total of 290 patients in our sample had both risk factors identified, yet NSAID use was implicated in only 78 of the 126 (62%) patients with documented *H. pylori* infection who were not treated. Finally, infected patients may not receive anti-*H. pylori* therapy because of a lack of effective information dissemination among primary care physicians regarding the role of *H. pylori* in peptic ulcer disease (17).

Although poor dissemination of information and guidelines may partially account for the poor quality of care regarding *H. pylori*-related ulcers, there is long standing and widespread acceptance of NSAID use as a cause of ulcer and its associated complications (32). Moreover, published guidelines have recommended the cautious use of NSAIDs in the elderly and education regarding the drugs' risks (33). A total of 74% of patients in our sample were screened for preadmission NSAID use, but only 24% were counseled about their risks and only 2% about specific ulcer risks. Although this may reflect a documentation bias, it appears that efforts to enhance physician–patient communication may result in improved quality of care.

Clinical practice guideline efforts are based on the belief that guidelines reduce practice variation, decrease cost and resource use, and improve outcomes (34, 35). It has been demonstrated that externally developed, national guidelines disseminated in journals are often less successful than internally developed guidelines with specific implementation strategies (36, 37). This study demonstrates that 1 yr after NIH guidelines for the diagnosis and treatment of peptic ulcer disease were published and disseminated, significant regional practice variation exists and that the process of care remains less than optimal. There is clearly an opportunity to improve the quality of care for hospitalized Medicare beneficiaries with peptic ulcer disease, and quality improvement initiatives must be undertaken. It remains to be seen which interventions, if any, will be most effective in changing provider behavior. The use by the HCQIP of multifaceted educational interventions (38, 39) may improve the processes of care and hold the potential for improving outcomes of care in Medicare patients hospitalized with peptic ulcer disease.

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Reprint requests and correspondence: Joshua J. Ofman M.D., M.S.H.S., 9100 Wilshire Blvd., Suite 655 E., Beverly Hills, CA 90212.

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