Published in final edited form as:

Dis Esophagus. 2008 ; 21(5): 452–456. doi:10.1111/j.1442-2050.2007.00800.x.

The Inaccuracy of ICD-9-CM Code 530.2 for Identifying Patients with Barrett's Esophagus

Brian C. Jacobson, MD, MPH¹ and Lauren B. Gerson, MD, MSc^{2,3}

¹ Section of Gastroenterology, Boston University Medical Center, Boston, MA

² Division of Gastroenterology, Stanford University Medical Center, Stanford, CA

³ Division of Gastroenterology, Palo Alto Veteran's Administration Medical Center, Palo Alto, CA

Abstract

Background—Barrett's esophagus is a chronic complication associated with gastroesophageal reflux disease. The ICD-9-CM code used for Barrett's esophagus, 530.2, is also used for patients with "ulcer of the esophagus."

Objectives—We aimed to determine if the ICD-9-CM code of 530.2 is reliable for identifying cases of Barrett's esophagus within databases for research purposes.

Methods—We reviewed the records of all patients assigned code 530.2 at two university medical center hospitals and a veterans' administration hospital over a cumulative 16 year period. Billing records provided information about where the code was assigned, whether it was a major or minor diagnosis, and if the code was assigned on multiple occasions for each patient. Histology and endoscopy records were reviewed to confirm the diagnosis of Barrett's esophagus.

Results—Among 435 patients with code 530.2 in their records, 354 (82%) had an esophageal biopsy reported and 393 (90%) had an endoscopy report available for review. Only 182 (42%) had specialized intestinal metaplasia documented in a biopsy from an area of salmon-colored mucosa arising above the esophagogastric junction (51% of those with histology available). There were 288 patients (66%) with an endoscopic diagnosis of Barrett's esophagus (73% of those with an endoscopy reported). Variables associated with documented specialized intestinal metaplasia were age ≥ 60 (odds ratio 2.3; 95% confidence interval 1.4–3.7), multiple assignments of 530.2 (odds ratio 3.2; 95% confidence interval 2.0–5.0), and assignment of 530.2 in GI clinic or an endoscopy unit (odds ratio 3.5; 95% confidence interval 2.0–6.3). The positive predictive value of the code being assigned in a GI location was 48% (95% confidence interval 43%–54%).

Conclusions—The ICD-9-CM code of 530.2 is not specific for the diagnosis of Barrett's esophagus. The usage of code 530.2 in a GI setting was not sufficiently predictive of BE to be reliable for rigorous epidemiological studies.

Keywords

Barrett's esophagus; ICD-9-CM; International Classification of Diseases

Address for Correspondence: Brian C. Jacobson, MD, MPH, Boston University Medical Center, 85 East Concord Street, Room 7721, Boston, MA 02118, Phone (617) 638-6563, Fax (617) 638-6529, brian.jacobson@bmc.org.

Authors' Contributions: Both authors shared in study design, data analysis, preparation of manuscript drafts, and approval of the finalized manuscript.

Neither author has any relevant conflicts of interest to report.

INTRODUCTION

Investigators performing epidemiological studies often rely on billing codes in databases to identify cases of a specific illness or condition. The codes most often used in this manner are International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes. Sources of these codes may be large Medicare databases, nationally-administered health surveys (such as the National Health Interview Survey), health care organization databases, or hospital billing records. Among studies within the field of Gastroenterology, these codes have been used to identify cases of such upper gastrointestinal conditions as gastroesophageal reflux disease, peptic ulcer disease, dyspepsia, and upper-GI hemorrhage.^{1–5} Unfortunately, if a diagnosis code is inaccurate, research based upon its assignment may be flawed. The ICD-9-CM code used for Barrett's esophagus (BE), 530.2, is also used for "ulcer of the esophagus" and thus may not be appropriate for identifying cases of Barrett's esophagus for research purposes. For example, a recent publication by the American Gastroenterological Association relied upon this code for identifying patients with BE and concluded that this condition is more prevalent among African-Americans than Caucasians,⁶ despite prior studies demonstrating that the condition is more prevalent in white males.⁷ Improving methods for using large databases has been cited as an important future development in GI epidemiology.⁸ With this goal in mind, we sought to determine how reliably a diagnosis of BE could be concluded based upon finding ICD-9-CM code 530.2 in a patient's medical records. We also attempted to identify variables present within administrative databases that might have a high predictive value for finding BE when code 530.2 was assigned.

MATERIALS AND METHODS

This study was a retrospective multi-center chart review approved by the Institutional Review Boards of each participating institution. The billing records of all patients receiving care at the hospitals affiliated with Boston University Medical Center (BU), Stanford University Medical Center (SU), and the Palo Alto Veterans' Administration Health Care System (PAVA) between 5/00 and 8/02 (BU), 11/97 and 7/03 (SU), and 8/96 and 5/04 (PAVA) were searched for the presence of ICD-9-CM code 530.2. Billing records from non-hospital-based clinics were not accessible and were therefore not included in this analysis. Available billing records contained information about where the ICD-9-CM code was assigned, whether it was coded as a primary diagnosis (major diagnosis) or a higher-order diagnosis (minor diagnosis), and if the code was assigned on multiple occasions for each patient. The code was considered assigned in a GI location if assigned in the endoscopy unit or Gastroenterology clinic. If ICD-9-CM code 530.2 was present, the patient's medical records were reviewed from 1996 onward looking specifically for endoscopy and pathology reports, and demographic variables including age, gender and self-reported race. We assigned 1996 as the baseline year as that was the first year electronic records were available at BU. Prior to that year, availability of paper records was deemed too unreliable. That year was subsequently applied at SU and PAVA for uniformity.

A patient was classified as having "definite BE" if specialized intestinal metaplasia (SIM) was documented in a biopsy taken from an area of salmon-colored mucosa above the esophagogastric junction.⁹ Specialized intestinal metaplasia of the cardia was not included in the definition of BE. If endoscopic findings suggested a columnar-lined esophagus (regardless of length), but pathology records failed to document SIM, the patient was classified as having "possible" BE because of potential sampling error. All EGD and pathology records were reviewed until SIM was documented. Once SIM was documented, there was no further review of either earlier or later studies. Other endoscopy findings recorded included the presence of esophageal ulcerations or any impression by the endoscopist of "esophagitis" (not formally characterized according to any classification system).

Statistical Analysis

We determined the prevalence of definite BE and possible BE among all patients with ICD-9-CM code 530.2 in their billing records. We also sought to identify variables present in a medical record that might help predict the presence of definite or possible BE in a patient assigned ICD-9-CM code 530.2. Univariate analyses were performed using the chi-square test for categorical variables and the Wilcoxon Rank-Sum test for continuous variables. For these analyses, race was categorized as Caucasian and non-Caucasian. Logistic regression was used to determine odds ratios for specific variables associated with BE. In the multivariate model, age was dichotomized into ≥ 60 and < 60 years. We calculated the positive predictive value (PPV) of variables with significant odds ratios using Exact methods. In our primary analysis only definite BE was used as the outcome. In a secondary analysis both definite and possible BE were used as a combined outcome. All tests were two-sided with a p value of < 0.05 being considered significant. Calculations were performed using SAS version 9.1 statistical software (SAS Institute Inc., Cary, NC).

RESULTS

There were 435 patients assigned ICD-9-CM code 530.2 during the periods reviewed. Of these, 78% were male, 75% were Caucasian, and the median age was 60 (inter-quartile range 48–72). Two-hundred and one patients of the 435 (46%) were from BU, 106 (24%) were from SU, and 128 (30%) were from the PAVA. During the period reviewed, the code 530.2 had been assigned on more than one occasion for 34% of patients and was a major diagnosis code in 64% of cases. For 93 (24%) patients, the first EGD available for review was performed for surveillance of previously-documented Barrett's esophagus. The code 530.2 was assigned in a GI location in 71% of cases (68% in an endoscopy unit and 3% in a Gastroenterology clinic), during a hospitalization in 24% of cases, and in other clinical settings in the remaining 5% of cases.

An endoscopy had been performed for 393 (90%) patients at one of the participating medical centers, and in these cases, all had an endoscopy report available for review. In the remainder of cases, endoscopy had either been performed elsewhere, or not at all. An esophageal biopsy had been taken from 354 patients (82%) and all had a pathology report reviewed.

Only 182/435 (42%) had SIM documented in an esophageal biopsy from an area of salmon-colored mucosa above the esophagogastric junction, thereby meeting the definition of definite BE (51% of those with a histology specimen). Columnar mucosa, but not documented SIM, was noted at endoscopy in 129/435 cases (30%), meeting the diagnosis of possible BE (33% of those with an endoscopy reported). Esophageal ulcerations ($n=33$) or esophagitis ($n=65$) without SIM was diagnosed by endoscopy in 98 patients (23%).

Primary Analysis (Definite Barrett's Esophagus)

Results of univariate analyses are shown in Table 1. Compared to those without documented SIM, patients with definite BE were more likely to be older, to be Caucasian, to have 530.2 assigned on multiple occasions, and to have it assigned in a GI location (primarily an endoscopy unit). In multivariate analyses, variables associated with documented SIM were age greater than 60 (OR 2.3; 95% CI 1.4–3.7), multiple assignments of code 530.2 (OR 3.2; 95% CI 2.0–5.0), and assignment of code 530.2 in GI clinic or an endoscopy unit (OR 3.5; 95% CI 2.0–6.3). The most predictive variable for finding documented SIM in a pathology record was having the diagnosis of 530.2 assigned in a GI location (PPV = 48%; 95% CI 43%–54%).

Secondary Analysis (Definite or Possible Barrett's Esophagus)

There were 313 patients (72%) with either documented SIM (n=182) or endoscopically-identified columnar mucosa without documented SIM (n=129). For this secondary analysis we assumed a "best case" scenario in which sampling error simply failed to demonstrate SIM when a columnar-lined esophagus was identified. In this case, only the assignment of 530.2 in a GI location reached statistical significance in a multivariate analysis (OR 7.2; 95% CI 4.0–12.8). Having the code assigned in a GI location was associated with a PPV of 84% (95% CI 79%–88%). Table 2 lists the sensitivity, specificity, and positive and negative predictive values for both definite and possible Barrett's esophagus.

DISCUSSION

We found that the ICD-9-CM code used to indicate the presence of BE was assigned to many patients without documented SIM. This is not surprising, given that this same code is also designated for "ulcer of the esophagus." In addition, many endoscopists may assign this code after an upper endoscopy reveals what appears to be columnar-lined esophageal mucosa but before there is histologic proof of SIM. In fact, having code 530.2 assigned in a GI setting was more predictive of the patient ultimately having SIM documented by histology, or at least having columnar mucosa identified in the esophagus during endoscopy.

BE remains an important focus of research because of its high prevalence and association with esophageal adenocarcinoma.^{10–12} However, the costs and inconveniences associated with surveillance coupled with the relative infrequency of esophageal adenocarcinoma highlight the need for better methods to risk-stratify patients who may harbor BE and dysplasia. Identifying useful risk factors associated with progression to dysplasia and cancer will likely require studying large numbers of patients both with and without BE. The sources of this patient information may be large databases maintained by health care organizations or Medicare. Being able to accurately identify which patients in a database have BE is essential for conducting useful research. Unfortunately, finding ICD-9-CM code 530.2 in a patient's records does not appear adequate for ensuring that the patient has BE.

Our study was limited to ICD-9-CM code 530.2. In some institutions, 530.1 ("esophagitis, unspecified") and 530.19 ("gastroesophagitis") may also be used to denote BE, although this code is not used for this purpose at our respective medical centers. A specific code for Barrett's esophagus does exist in the ICD-10 coding system, but this newer system has not yet been implemented in the United States, and may not be activated until 2010.¹³ An even more specific code for esophageal SIM might improve the accuracy of epidemiologic studies seeking to use large amounts of patient information stored in national databases. Within the Systematized Nomenclature of Medicine (SNOMED) coding system, there is a histologic morphology code for gastric metaplasia.¹³ Unfortunately, without specifically coding for SIM of the esophagus, such a histologic coding system would still be unreliable. For example, BE could only be verified in 77% of patients identified in one study by searching records for both the gastric metaplasia SNOMED code and an esophagus/gastroesophageal junction topography code.¹⁴ Furthermore, most national medical databases, such as those maintained by Medicare, rely on the ICD-9 coding system, while the SNOMED system is typically used within institutions.

A limitation of our study was our inability to account for patients assigned ICD-9 code 530.2 in non-hospital settings such as primary care offices. Therefore the total number of patients assigned this code within our respective medical centers may be underestimated. This would bias our findings toward patients with a history of endoscopy. Our observed positive predictive value for the ICD-9 code 530.2 being assigned in a GI location may therefore be higher than what would be expected in all settings. However, while our findings may not be generalizable

to all clinical settings, we expect the assignment of ICD-9 code 530.2 to be even less accurate for predicting true Barrett's esophagus when used in non-GI locations.

Another limitation of our study was the failure to analyze the accuracy of ICD-9 code 530.2 based upon varying lengths of BE segments. For example, it has been demonstrated that the likelihood of documenting SIM within esophageal columnar epithelium increases as the length of columnar epithelium increases.¹⁵ In this retrospective analysis, however, we were concerned we did not have an accurate measure of BE length to further stratify our analyses. It was for this reason that we included a secondary analysis combining both definite and possible cases together into a "best case scenario." In this secondary analysis, we assumed that all cases had true BE, and that failure to diagnose SIM was simply due to sampling error. Unfortunately, our findings indicate that even in this "best case scenario", there were still many patients for whom BE could not be verified.

In summary, ICD-9-CM code 530.2 was not specific for BE and was used for patients without histologic evidence of BE in a majority of cases. When code 530.2 was assigned in a GI clinic or an endoscopy unit, it correctly predicted finding histologic proof of BE 48% of the time, a number likely to be too unreliable for epidemiological studies. If a less stringent definition of BE is acceptable (SIM and/or an endoscopic appearance of BE), the assignment of 530.2 in a GI setting predicted BE 84% of the time. Investigators performing BE research would be wise to verify a pathologic diagnosis of BE for any patient identified only by ICD-9-CM codes.

Acknowledgments

We would like to thank Dr. Bradford A. Weiner for help with data abstraction. Supported in part by the National Institutes of Health K08 DK070706 (Dr. Jacobson).

References

1. Cooper GS, Yuan Z, Rosenthal GE, Chak A, Rimm AA. Lack of gender and racial differences in surgery and mortality in hospitalized Medicare beneficiaries with bleeding peptic ulcer. *Journal of General Internal Medicine* 1997;12:485–90. [PubMed: 9276654]
2. Cooper GS, Chak A, Lloyd LE, Yurchick PJ, Harper DL, Rosenthal GE. The accuracy of diagnosis and procedural codes for patients with upper GI hemorrhage. *Gastrointest Endosc* 2000;51:423–426. [PubMed: 10744813]
3. Jacobson BC, Ferris TG, Shea TL, Mahlis EM, Lee TH, Wang TC. Who is using chronic acid-suppression therapy and why? *Am J Gastroenterol* 2003;98:51–58. [PubMed: 12526936]
4. Sandler RS, Everhart JE, Donowitz M, et al. The burden of selected digestive diseases in the United States. *Gastroenterology* 2002;122:1500–1511. [PubMed: 11984534]
5. Everhart JE, Byrd-Holt D, Sonnenberg A. Incidence and risk factors for self-reported peptic ulcer disease in the United States. *American Journal of Epidemiology* 1998;147:529–36. [PubMed: 9521179]
6. The American Gastroenterological Association. *The Burden of Gastrointestinal Diseases*. Bethesda: The American Gastroenterological Association; 2001.
7. Cameron AJ, Lomboy CT. Barrett's esophagus: age, prevalence, and extent of columnar epithelium. *Gastroenterology* 1992;103:1241–1245. [PubMed: 1397881]
8. Lang L. Future of GI epidemiology. *Gastroenterology* 2002;123:966.
9. Spechler SJ, Goyal RK. Barrett's esophagus. *N Engl J Med* 1986;315:362–371. [PubMed: 2874485]
10. Winters C, Spurling TJ, Cohbanian S, et al. Barrett's esophagus: a prevalent, occult complication of gastroesophageal reflux disease. *Gastroenterology* 1987;92:118–124. [PubMed: 3781178]
11. Gerson LB, Shetler K, Triadafilopoulos G. Prevalence of Barrett's esophagus in asymptomatic individuals. *Gastroenterology* 2002;123:461–467. [PubMed: 12145799]
12. Cameron AJ. Epidemiology of columnar-lined esophagus and adenocarcinoma. *Gastroenterol Clin North Am* 1997;26:487–494. [PubMed: 9309399]

13. Cote, R., editor. College of American Pathologists. SNOMED International: The Systematized Nomenclature of Human and Veterinary Medicine. Northfield, IL: College of American Pathologists; 1993.
14. Dulai GS, Shekelle PG, Jensen DM, et al. Dysplasia and risk of further neoplastic progression in a regional veterans administration Barrett's cohort. *Am J Gastroenterol* 2005;100:775–783. [PubMed: 15784018]
15. Csendes A, Smok G, Burdiles P, et al. Prevalence of intestinal metaplasia according to the length of the specialized columnar epithelium lining the distal esophagus in patients with gastroesophageal reflux. *Dis Esoph* 2003;16:24–28.

Table 1

Comparison of patients assigned ICD-9-CM code 530.2 with and without documented SIM

	SIM Present (n=182)	No SIM Present (n=249)	P value
Median Age (inter-quartile range)	63 (50–73)	58 (47–71)	0.05
Male (%)	77	78	0.73
Caucasian (%)	77	65	0.007
Major Diagnosis of 530.2 (%)	69	61	0.07
Assigned in a GI Location (%)	81	63	<0.001
Multiple Assignments of 530.2 (%)	47	24	<0.001

SIM = Specialized intestinal metaplasia in a biopsy taken from an area of salmon-colored mucosa above the esophagogastric junction.

Table 2

Sensitivity, Specificity, Positive Predictive Value, and Negative Predictive Value for Definite or Possible Barrett's Esophagus Based Upon Finding ICD-9 code 530.2 Assigned in a GI Location

	Definite Barrett's Esophagus [*] (n=182)	Definite or Possible Barrett's Esophagus [†] (n=313)
Sensitivity	81% (95% CI 75%–87%)	83% (95% CI 78%–87%)
Specificity	37% (95% CI 31%–43%)	58% (95% CI 49%–67%)
Positive Predictive Value	48% (95% CI 43%–54%)	84% (95% CI 79%–88%)
Negative Predictive Value	73% (95% CI 64%–80%)	57% (95% CI 48%–66%)

^{*} Definite Barrett's esophagus = specialized intestinal metaplasia documented in a biopsy taken from an area of salmon-colored mucosa above the esophagogastric junction.

[†] Possible Barrett's esophagus = columnar-appearing mucosa visualized above the esophagogastric junction during endoscopy