UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF NORTH CAROLINA

UNITED STATES OF AMERICA,
ex rel. INTEGRA MED ANALYTICS LLC,

Plaintiff,

v.

1. THE CHARLOTTE-MECKLENBURG HOSPITAL AUTHORITY, INC. (also d/b/a the Carolinas HealthCare System, Carolinas HealthCare System Kings Mountain Hospital, Carolinas Medical Center, Carolinas Medical Center – NorthEast, Carolinas Medical Center – Lincoln, Carolinas Medical Center – Union, Carolinas Medical Center – University, Cleveland County Healthcare System, Cleveland Regional Medical Center, Stanly Regional Medical Center, Carolinas HealthCare System Stanly),
2. BLUERIDGE HEALTHCARE HOSPITALS, INC. (also d/b/a Carolinas HealthCare System Blue Ridge – Morganton),
3. CAROLINAS ANSON HEALTHCARE, INC. (also d/b/a Carolinas HealthCare System Anson),
4. MERCY HOSPITAL, INC. (also d/b/a Carolinas Medical Center – Mercy),
5. THE MOSES H. CONE MEMORIAL HOSPITAL OPERATING CORP.,
6. THE MOSES H. CONE MEMORIAL HOSPITAL,
7. MURPHY MEDICAL CENTER, INC.,
8. SCOTLAND MEMORIAL HOSPITAL, INC.,
9. WRMC HOSPITAL OPERATING CORP.,

Defendants.

Case No.:

ORIGINAL COMPLAINT

FILED UNDER SEAL PURSUANT TO 31 U.S.C. § 3730

This is an action brought by Plaintiff/Relator Integra Med Analytics LLC ("**Relator**") on behalf of the United States of America pursuant to the Federal False Claims Act, 31 U.S.C. § 3729, et seq. In support thereof, Relator alleges as follows:

I. INTRODUCTION

1. The Charlotte-Mecklenburg Hospital Authority, which conducts business under the name "Carolinas HealthCare System," is the nation's second largest public health system, owning or operating 39 hospitals in North and South Carolina. The Charlotte-Mecklenburg Hospital Authority operates this system through a number of wholly-owned and/or controlled entities, including defendants Blueridge HealthCare Hospitals, Inc. (also d/b/a Carolinas HealthCare System Blue Ridge – Morganton); Carolinas Anson HealthCare, Inc. (also d/b/a Carolinas HealthCare System Anson); Mercy Hospital, Inc. (also d/b/a Carolinas Medical Center – Mercy); The Moses H. Cone Memorial Hospital Operating Corp.; The Moses H. Cone Memorial Hospital; Murphy Medical Center, Inc.; Scotland Memorial Hospital, Inc.; WRMC Hospital Operating Corp. (collectively referred to herein as "**Defendants**" or "**Carolinas**").

2. Carolinas received approximately $718 million in Medicare reimbursements for inpatient stays at its short term acute care facilities, including those with a management agreement, in fiscal year 2015. To establish amounts billed to Medicare for patient services, hospital systems like Carolinas must properly code such services according to preapproved standards. Indeed, "billing and coding integrity" is a key component to Carolinas' Code of Business Conduct, which underscores Carolinas' commitment to ensure that "Carolinas HealthCare System bills only for

care and services that it provides which are properly authorized and documented as medically necessary—nothing less and nothing more."[1]

3. Relator put Carolinas' Code of Business Conduct to the test by applying proprietary statistical analysis to detect fraudulent upcoding of services billed to Medicare throughout the Carolinas group of hospitals. Relator found that Defendants repeatedly used unwarranted Major Complication and Comorbidity secondary codes from 2011 through 2015, which fraudulently increased the value of many claims submitted to Medicare for reimbursement.

4. Relator confirmed the nature and extent of the fraud by analyzing a variety of alternative explanations and potential controls that could explain the observed patterns. These potential explanations have been ruled out by Relator's proprietary econometric analysis. To be conservative, only the most extreme cases of upcoding have been identified herein as fraudulent, and Relator has confirmed the results of its analysis to be statistically significant.

5. Based on its analysis, Relator has determined that Defendants have submitted more than $61.68 million in false claims for Medicare reimbursement from 2011 through 2015.

II. JURISDICTION AND VENUE

6. This Court has subject matter jurisdiction over this action pursuant to 31 U.S.C. § 3732(a) and 28 U.S.C. § 1331.

7. This Court has personal jurisdiction over each named Defendant because, inter alia, the Defendants transacted business in this District; reside in this District; engaged in wrongdoing in this District; and/or caused the submission of false or fraudulent claims in this District.

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[1] Carolinas HealthCare System, Code of Business Conduct at 18, *available at* https://goo.gl/pYcWM9.

8. Venue is proper in this District under 31 U.S.C. § 3732(a) and 28 U.S.C. § 1391(b) and (c). During the relevant time period, a substantial portion of the events complained of that gave rise to Plaintiff's claims occurred in this District in violation of 31 U.S.C. § 3729 and § 3730. Further, 31 U.S.C. § 3732(a) provides for nationwide service of process.

9. There has been no public disclosure of the allegations herein. To the extent that there has been a public disclosure unknown to Relator, Relator is an "original source" under 31 U.S.C. § 3730(e)(4). Relator has direct and independent knowledge of the information on which the allegations are based and voluntarily provided the information to the Government before filing this *qui tam* action based on that information. *See* 31 U.S.C. § 3730(e)(4).

III. PARTIES

10. Relator Integra Med Analytics LLC is a Texas limited liability company with its principal place of business in Austin, Texas.

11. Relator is an associated company of Integra Research Group LLC, which specializes in using statistical analysis to uncover and prove fraud. Integra Research Group LLC's sister company, Integra REC LLC, has extensive experience using statistical analysis to detect and prove fraud, specifically in mortgage-backed securities and other financial markets. Integra REC LLC has successfully initiated numerous cases under the False Claims Act.

12. Defendant Charlotte-Mecklenburg Hospital Authority, Inc. (also d/b/a the Carolinas HealthCare System, Carolinas HealthCare System Kings Mountain Hospital, Carolinas Medical Center, Carolinas Medical Center – NorthEast, Carolinas Medical Center – Lincoln, Carolinas Medical Center – Union, Carolinas Medical Center – University, Cleveland County Healthcare System, Cleveland Regional Medical Center, Stanly Regional Medical Center, Carolinas HealthCare System Stanly) is a North Carolina hospital authority organized under the

North Carolinas Hospital Authorities Act with its principal place of business in Charlotte, North Carolina. Its registered agent in North Carolina is Keith Smith, 1111 Metropolitan Avenue, Suite 600, Charlotte, North Carolina 28204.

13. Defendant Blueridge Healthcare Hospitals, Inc. (also d/b/a Carolinas HealthCare System Blue Ridge – Morganton) is a North Carolina nonprofit corporation with its principal place of business in Morganton, North Carolina. Its registered agent in North Carolina is Thomas Eure, 2201 S. Sterling Street, Morganton, North Carolina 28655.

14. Defendant Carolinas Anson Healthcare, Inc. (also d/b/a Carolinas HealthCare System Anson) is a North Carolina nonprofit corporation with its principal place of business in Monroe, North Carolina. Its registered agent in North Carolina is Keith Smith, 1111 Metropolitan Avenue, Suite 600, Charlotte, North Carolina 28204.

15. Defendant Mercy Hospital, Inc. (also d/b/a Carolinas Medical Center – Mercy) is a North Carolina nonprofit corporation with its principal place of business in Charlotte, North Carolina. Its registered agent in North Carolina is Keith Smith, 1111 Metropolitan Avenue, Suite 600, Charlotte, North Carolina 28204.

16. Defendant Moses H. Cone Memorial Hospital Operating Corp. is a North Carolina nonprofit corporation with its principal place of business in Greensboro, North Carolina. Its registered agent in North Carolina is Cheryl Koob, 1200 North Elm Street, Greensboro, North Carolina 27401.

17. Defendant Moses H. Cone Memorial Hospital is a North Carolina nonprofit corporation with its principal place of business in Greensboro, North Carolina. Its registered agent in North Carolina is Cheryl Koob, 1200 North Elm Street, Greensboro, North Carolina 27401.

18. Defendant Murphy Medical Center, Inc. is a North Carolina nonprofit corporation with its principal place of business in Murphy, North Carolina. Its registered agent in North Carolina is Michael J. Stevenson, 2002 Highway 64 East, Murphy, North Carolina 28906.

19. Defendant Scotland Memorial Hospital, Inc. is a North Carolina nonprofit corporation with its principal place of business in Laurinburg, North Carolina. Its registered agent in North Carolina is William R. Purcell II, 210 W. Cronly Street, Laurinburg, North Carolina 28352.

20. Defendant WRMC Hospital Operating Corp. is a North Carolina nonprofit corporation with its principal place of business in North Wilkesboro, North Carolina. Its registered agent in North Carolina is J. McLain Wallace, Jr., 1370 West D. Street, P. O. Box 609 North Wilkesboro, North Carolina 28659.

IV. SUBSTANTIVE ALLEGATIONS

A. Overview of Medicare Reimbursement and Upcoding

21. Medicare makes payments to hospitals on a per-discharge basis, *i.e.*, one payment for each inpatient hospital stay. The payment is designed to cover the average cost of resources needed to treat each patient's needs. To account for the patient's needs, Medicare assigns each discharge to a diagnosis related group (a "**DRG**"), which groups patients with similar clinical problems that are expected to require similar amounts of hospital resources.[2] The DRG is the single most impactful factor in determining the average payment for a claim, which can be further adjusted by hospital-specific factors such as market conditions in the hospital's city, indirect medical education payments, and disproportionate share payments.

[2] *See* Medpac, *Hospital Acute Inpatient Services Payment System Payment Basics* at 1 (Oct. 2016), *available at* https://goo.gl/NsG1Zr.

22. The DRG is primarily determined by three types of codes from a Medicare claim: the principal diagnosis code, surgical procedure codes, and secondary diagnosis codes. The principal diagnosis code is defined as the "condition established after study to be chiefly responsible for occasioning the admission of the patient to the hospital for care."[3] Surgical procedure codes represent surgical procedures performed in an operating room setting at the hospital. Secondary diagnoses represent "all conditions that coexist at the time of admission, that develop subsequently, or that affect the treatment received and/or the length of stay."[4]

23. There are more than 330 base DRGs, and each base DRG can have up to three severity levels: (i) without Complication or Major Complication, (ii) with Complication, and (iii) with Major Complication.[5] The secondary diagnoses on the claim determine the severity level of a DRG. The Centers for Medicare and Medicaid Services (the "**CMS**") publishes a list of codes each year that, when added to a claim, result in the claim being considered a Complication or Comorbidity (a "**CC**") or Major Complication or Comorbidity (an "**MCC**"). Adding a CC secondary code to a claim can increase the value of the claim from anywhere between approximately $1,000 and $10,000. Adding an MCC secondary code can increase the value $1,000 to $25,000. Hospitals are thus incentivized to add unwarranted secondary diagnosis codes to Medicare reimbursement claims.

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[3] *See* Centers for Disease Control, *ICD-9-CM Official Guidelines for Coding and Reporting* at 88 (Oct. 1, 2011), *available at* https://goo.gl/AUENUq.

[4] *Id.* at 91.

[5] *See* Medpac, *Hospital Acute Inpatient Services Payment System Payment Basics* at 1 (Oct. 2014), *available at* https://goo.gl/NsG1Zr.

B. Relator's Methodology

24. To detect patterns of fraud at Carolinas, Relator employed unique algorithms and statistical processes to analyze inpatient claims data for short term acute care hospitals from 2011 through 2015,[6] obtained from the CMS. These proprietary methods have allowed Relator to identify with specificity the false claims made by the Defendant to fraudulently inflate revenue on Medicare claims. Relator's analysis focused on identifying certain secondary diagnoses codes—MCCs or CCs—that were fraudulently added by the Defendant to Medicare claims to increase reimbursements.

25. Relator first developed a proprietary regression analysis to identify hospitals engaged in fraudulent coding. Regression analysis is well established and has been used to pinpoint actors behind misreporting in financial and economic contexts.[7] Here, Relator's regression analysis analyzed millions of claims and thousands of possible fraudulent patterns to estimate the total fraud committed by each inpatient hospital provider in the United States. The analysis also controlled for various disease categories, demographic, and personal characteristics of the individuals being treated. Carolinas stood out in this analysis as one of the most fraudulent healthcare providers in the country. But rather than rely solely on the inferences from this proprietary regression methodology, Relator developed a method that would also: a) identify specific cases of upcoding,

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[6] Only claims through the third quarter of 2015 were analyzed by Relator. Beginning October 1, 2015, CMS transitioned to ICD-10, so analysis of those claims was kept separate. Throughout this report, when references are made to 2015 claims, it is referring to the first three quarters of 2015 only.

[7] Tomasz Piskorski, Amit Seru, and James Witkin, *Asset Quality Misrepresentation by Financial Intermediaries: Evidence from the RMBS Market*, The Journal of Finance, Vol. 70.6 at 2635–2678 (2015); Griffin, John M., and Gonzalo Maturana, *Who Facilitated Misreporting in Securitized Loans?*, Review of Financial Studies, Vol. 29.2 at 384–419 (2016).

and b) confirm with a high degree of confidence that a specific and narrow group of claims was fraudulently upcoded.

26. To accomplish this goal, Relator first created a "benchmark" universe of hospital systems against which Relator compared Carolinas' coding practices. As it would be misleading to compare Carolinas to other systems with similar false claims, Relator excluded from its benchmark the top one-third of hospital systems that the regression analysis identified as conducting excessive billing practices—many of which have been charged and fined for precisely the fraudulent coding practices described in this Complaint. Because Relator excluded the most egregious offenders but still included claims from two-thirds of hospital systems, many of which are likely to have committed their own acts of upcoding, Relator's benchmark universe is conservative. In effect, any upcoding in the 67% of U.S. hospital systems included in Relator's benchmark would reduce the Relator's calculation of fraud at Carolinas. As discussed below, as a robustness check, Relator also quantified the impact of comparing Carolinas to the entire universe of short term acute care hospitals. Results when comparing to the entire universe of hospitals were similar to the results obtained from comparing to the benchmark.

27. While Relator's precise benchmarking of medical billing is unique, experts have developed and applied similar benchmarks in financial return literature.[8] Benchmarking has the advantage of allowing for very specific and comparative groupings. This avoids imposing specific

[8] See the widely-used methodology developed by Kent Daniel, Mark Grinblatt, Sheridan Titman, Russ Wermers, *Measuring Mutual Fund Performance with Characteristic-Based Benchmarks*, The Journal of Finance, vol. 52(3) at 1035–1058 (1997). This methodology is first applied to measuring hedge-fund performance by, John M. Griffin and Jin Xu, *How Smart Are the Smart Guys? A Unique View from Hedge Fund Stock Holdings*, Review of Financial Studies, Vol. 22.7 at 2531–2570 (2009).

linearity on the data, which in turn gives Relator's methodology more statistical power and precision.

28. Relator first formed groupings corresponding to 123 specific principal diagnosis codes. To control for the patient's principal diagnosis, Relator used these groupings as comparative "bins." Within each bin, Relator compared the usage rate of specific MCCs at hospitals in the Carolinas system to usage rates in other acute care inpatient hospitals in the benchmark universe. Relator included only the principal diagnosis code groups that were used excessively by Carolinas. In addition, to ensure that only the truly fraudulent claims were analyzed, Relator excluded any claims for which adding an MCC did not increase the value.[9] Similarly, Relator excluded any claims involving patients who died in the course of their treatment, as these claims tend to involve patients that are sicker and have higher rates of MCCs.

29. Given that some natural variation in usage rates among hospitals is expected, Relator used two filters to further ensure that it identified truly abnormal usage. First, only instances where MCCs were used more than twice the national rate or were used at a rate three percentage points higher than in the benchmark population were considered false claims. Second, Relator validated the results of its analysis by determining the statistical significance of each fraudulent pattern used by Carolinas. Relator only flagged claim groupings where there was less than a one-thousandth percent chance of Relator's findings being due to chance.

30. For example, Carolinas and other hospitals have a large number of claims involving a fracture of the neck of the femur (all ICD-9 principal diagnosis codes beginning with 820).

[9] Some diagnosis related groups do not have an MCC severity level, and as such, adding an MCC does not increase the reimbursement amount.

Relator has found that among Carolinas' 5,191 claims involving a femoral neck fracture, 332 had had an accompanying secondary MCC of encephalopathy,[10] representing 6.40 percent of their femoral neck fracture claims. The benchmark universe of hospitals had more than 500,000 femoral neck fracture claims, but only 3.26 percent of those claims reported encephalopathy as an MCC. In other words, Carolinas coded encephalopathy on these claims at a rate that is 1.96 times higher than comparable hospitals—and profited nearly $6,000 each time it did so.

31. To further validate its conclusions, Relator ran a fixed effect linear regression model with a variety of controls. Relator included variables to control for patient characteristics such as age, gender, and race, as well as county demographic factors such as the unemployment rate, median income, and urban-rural differences. Additionally, variables for the principal diagnosis group, length of stay, and discharge status were included to control for the patient's health and overall claim severity. Relator also tested for the potential impact that doctors, individual patients, and the hospital's region could have on MCC rates. Even when considering all of these factors, Carolinas' MCC usage rate is significantly higher than at the benchmark hospitals.

C. Defendants' False Claims

1. The False Claims made by Carolinas

32. Relator has determined that 16 of the Carolinas hospitals, including those with a management agreement, primarily used three categories of secondary MCC codes to increase the value of its claims: encephalopathy (including toxic encephalopathy), respiratory failure (which also includes pulmonary insufficiency), and heart failure (collectively, the "**Misstated MCCs**"). These will be discussed in more detail in the following sections.

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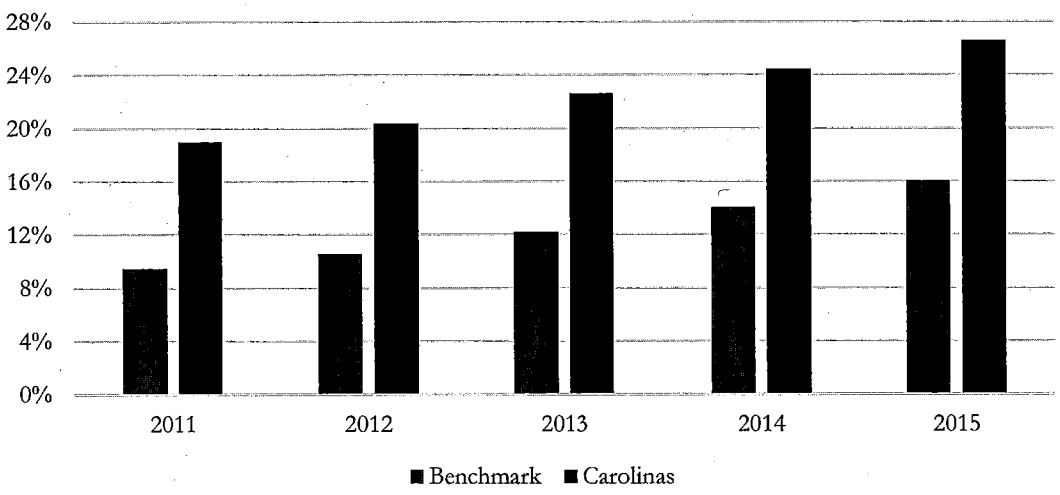
[10] See section C.1.A for a description of encephalopathy and the relevant codes that are included.

33. As illustrated in Figure 1, Carolinas used the Misstated MCCs at a significantly higher rate than benchmark hospitals. Specifically, across the relevant patterns used by Carolinas to upcode, the benchmark hospitals used one of these three codes on approximately 12.23 percent of claims from 2011 through 2015, while Carolinas hospitals used one of these three codes on 22.55 percent of such claims—about twice the benchmark rate. Additionally, Carolinas' usage of these codes has been increasing over time.

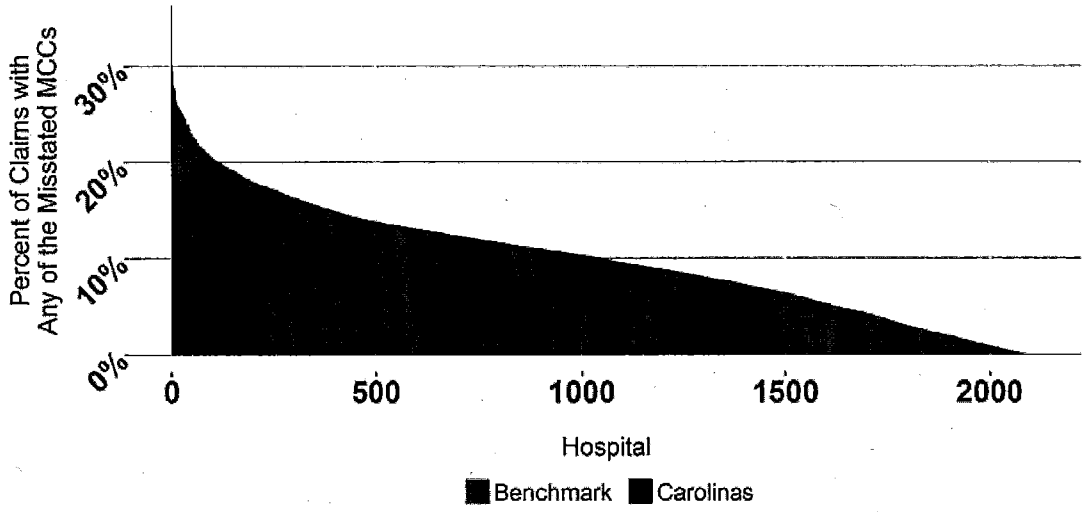
Figure 1. Rate of MCC Usage by Year for Benchmark Hospitals and Carolinas
This figure shows the rate at which Carolinas is using one of the Misstated MCCs relative to the benchmark hospitals over time. This analysis is based on the principal diagnosis codes listed in each section for the specific fraudulent patterns.



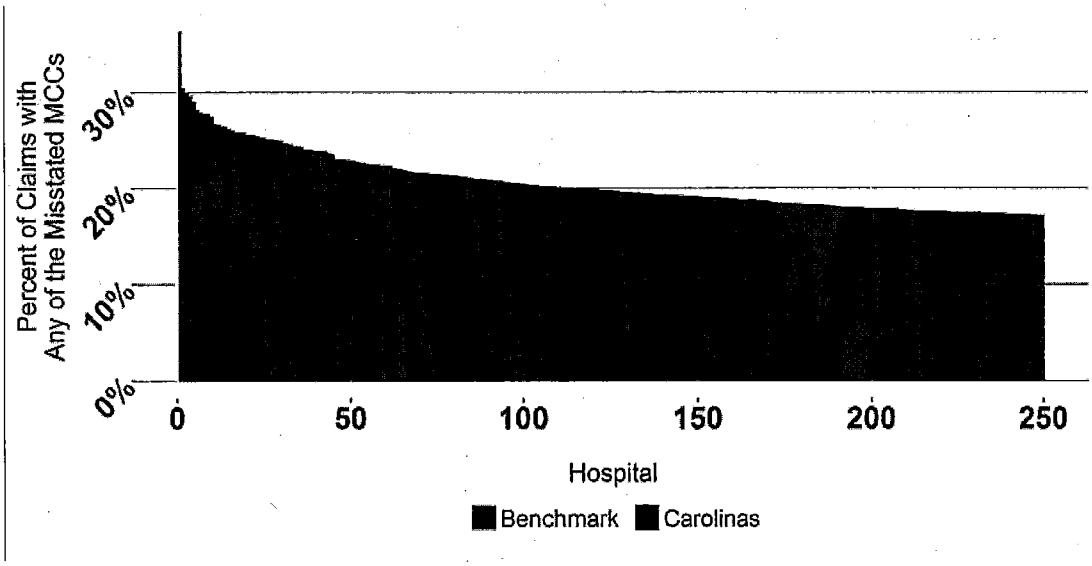
34. The following figures show just how drastic some of these patterns are when individual hospitals are analyzed, and demonstrate how widespread this abuse is at nearly all the Carolinas hospitals. As shown in Figure 2, Panels A and B, Carolinas has 16 of the top 250 hospitals based on rate of any of the Misstated MCCs, including 12 in the top 100. If this distribution were random, the statistical probability of a system with 19 hospitals having 16 of the top 250 hospitals is less than 1 in 4.9 billion.

Figure 2. Rate of MCC by Hospital
The following figure plots every Provider with at least 100 claims in the relevant principal diagnosis code categories. 2,119 hospitals had at least 100 claims with the relevant principal diagnosis codes. The hospitals are plotted along the x-axis in order of highest percentage of Misstated MCC usage. Panel A shows all hospitals while Panel B focuses on the top 250 hospitals. Carolinas has 16 of the top 250. The Carolinas hospitals are in red, while the benchmark hospitals are in blue.

Panel A: All Hospitals



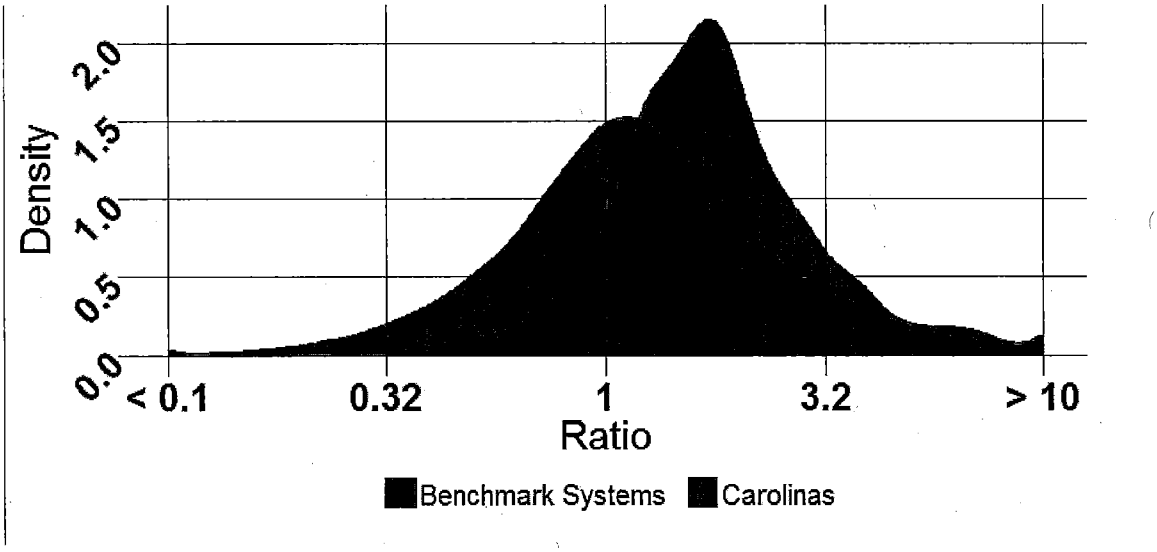
Panel B: Top 250 Hospitals



35. Figure 3 below shows that Carolinas used a higher rate of MCC codes not just in the few categories analyzed by Relator, but across a large variety of principal diagnosis codes.

Additionally, the extent to which Carolinas excessively upcoded on the categories identified by Relator was not offset by a relative downcoding for other categories. As the following figure shows, Carolinas consistently upcoded relative to the benchmark hospitals.

Figure 3. Distribution of Patterns by Rate of MCCs Relative to Benchmark Average.
This figure shows the distribution of the patterns (combinations of a principal diagnosis and a secondary MCC) based on the ratio between Carolinas' MCC usage rate (shown in red) and the usage rate at benchmark hospital systems (shown in Blue). A ratio of one signifies that an MCC is used at the same rate as the benchmark national average, and a ratio of 10 means it's used 10 times as often. The y-axis measures the relative number of patterns with each ratio.



A. Encephalopathy

36. The first Misstated MCC fraudulently used by Carolinas to make false claims is encephalopathy. The codes included with encephalopathy are listed in Table 1. Encephalopathy is a catch-all term for brain disease or damage to the brain where the brain is regarded as "altered in its structure or function."[11] The telltale symptom is an "altered mental state." Encephalopathy can be acute or chronic, so the related signs and symptoms can be varied as well. This condition

[11] National Institute of Neurological Disorders and Stroke, *Encephalopathy Information Page*, https://goo.gl/VuPVX4 (last visited May 24, 2017).

commonly manifests as confusion, agitation, or lethargy, but may include aphasia (altered speech), ataxia (altered gait) and memory loss.

Table 1. Encephalopathy Diagnosis Codes

ICD-9 Diagnosis Code	Description
34830	Encephalopathy, unspecified
34831	Metabolic encephalopathy
34839	Other encephalopathy
34982	Toxic encephalopathy

37. The most common causes of encephalopathy are liver damage, cerebral anoxia (severe lack of oxygen to the brain) or kidney failure.[12] Because the causes are extremely varied, no single lab test can prove the presence of encephalopathy.[13] Therefore, in diagnosing the condition, a medical practitioner must keep multiple considerations in mind. The challenge is to properly identify the root cause of the symptoms observed and eliminate unlikely causes based on objective signs, which makes the attendant lab work so vital to a proper diagnosis.

38. Encephalopathy is distinguishable from conditions that have similar symptoms. In elderly hospital patients, for instance, temporary instances of lethargy, agitation, and confusion are commonly observed, often right after an intense surgery or as the result of a urinary tract infection. These same signs can be observed in patients as "sundowning" or "late-day confusion" in the late afternoon or evening, but these effects are temporary and are actually related to chronic dementia, not encephalopathy.[14] Also, diabetes mellitus sometimes causes an imbalance in electrolytes,

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[12] Medicine Net, *Medical Definition of Encephalopathy*, https://goo.gl/bCAqNE (last visited May 24, 2017). Tumors, trauma, toxins from drugs and/or alcohol, bacteria, viruses or prions are also possible causes. National Institute of Neurological Disorders and Stroke, *Encephalopathy Information Page*, https://goo.gl/VuPVX4 (last visited May 24, 2017).

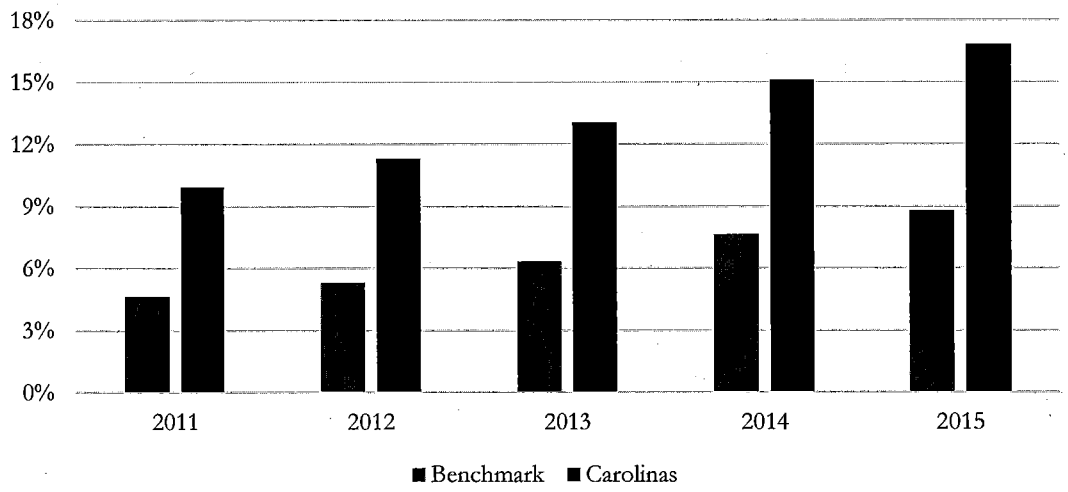
[13] Blood tests, spinal fluid samples, radiological imaging, electroencephalogram may be used to pinpoint the underlying cause. *Id.*

[14] Brenda Jordan, *Understanding Dementia and Delirium*, https://goo.gl/D3Hx4F (last visited May 24, 2017).

which may impact the functioning of the brain such that initially it would seem to point to encephalopathy. However, in all these instances, it is unlikely that actual brain damage has occurred, and thus the code of encephalopathy in unwarranted.

39. Between 2011 and 2015, Carolinas was more than 2 times more likely to use encephalopathy than benchmark hospitals. During this period, Carolinas coded encephalopathy on 13.22 percent of its claims, compared to 6.41 percent at benchmark hospitals, for the relevant patterns. Additionally, Carolinas' usage of encephalopathy generally increased over time as shown in Figure 4.

Figure 4. Rate of Encephalopathy by Year for Benchmark Hospitals and Carolinas
This figure shows the rate of encephalopathy at Carolinas and at the benchmark hospitals from 2011 through 2015, when added to the relevant principal diagnosis codes listed in Table 2.



i. Specific Patterns of Fraud with Encephalopathy

40. Table 2 provides a list of the principal diagnosis codes used by Carolinas to upcode with encephalopathy. Relator identified 60 principal diagnosis codes in conjunction with which Carolinas coded encephalopathy at a rate at least two times and/or three percentage points higher than the benchmark average. Relator has included only patterns that were statistically significant at the 99.9% level, meaning it is virtually impossible the patterns are due to chance.

Table 2. Patterns Used by Carolinas to Upcode with Encephalopathy

Principal Diagnosis Code	% with MCC Code in Benchmark	% with MCC Code in Carolinas	Carolinas Rate Relative to Benchmark	Num. of Fraud Claims at Carolinas
Septicaemia	15.69%	24.88%	159%	1,562
Other Disorders of Urethra and Urinary Tract	12.55%	31.98%	255%	1,111
Acute Renal Failure	9.53%	17.32%	182%	669
Pneumonia, Organism Unspecified	4.13%	9.57%	232%	508
Pneumonitis due to Solids and Liquids	10.57%	21.54%	204%	371
Occlusion of Cerebral Arteries	6.71%	11.88%	177%	337
Diabetes Mellitus	4.86%	9.66%	199%	255
Disorders of Fluid, Electrolyte, and Acid-Base Balance	5.6%	11.4%	204%	227
Fracture of Neck of Femur	3.26%	6.4%	196%	163
Epilepsy	12.33%	23.25%	189%	155
Other Injury and Poisoning	5.03%	11.38%	226%	127
Other Bacterial Pneumonia	4.98%	10.97%	220%	115
Other Cellulitis and Abscess	1.66%	4.28%	257%	112
Chronic Bronchitis	1.07%	2.32%	216%	97
Intestinal Infections due to Other Organisms	3.4%	7.47%	220%	96
Poisoning by Psychotropic Agents	18.32%	35.54%	194%	86
Poisoning by Analgesics, Antipyretics, and Antirheumatics	22%	38.07%	173%	85
General Symptoms	6.02%	10.09%	168%	57
Intracerebral Hemorrhage	11.05%	19.69%	178%	55
Subarachnoid, Subdural, and Extradural Hemorrhage, Following Injury	6.74%	10.58%	157%	48
Poisoning by Sedatives and Hypnotics	21.65%	47.95%	221%	38
Other Disorders of Bone and Cartilage	2.13%	4.47%	210%	37
Other Infectious and Parasitic Diseases	6.07%	12.01%	198%	37
Occlusion and Stenosis of Precerebral Arteries	1.75%	3.91%	224%	36
Cholelithiasis	1.35%	2.79%	207%	34
Liver Abscess and Sequelae of Chronic Liver Disease	4.53%	8.39%	185%	32
Late Effects of Cerebrovascular Disease	8.18%	19.29%	236%	31

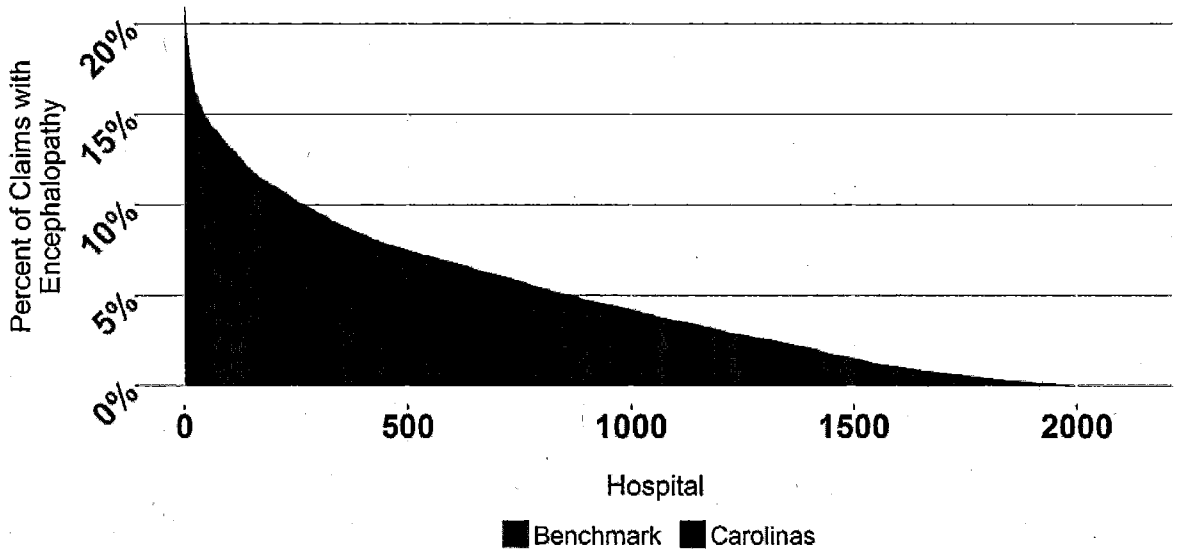
Principal Diagnosis Code	% with MCC Code in Benchmark	% with MCC Code in Carolinas	Carolinas Rate Relative to Benchmark	Num. of Fraud Claims at Carolinas
Disorders of the Pituitary Gland and its Hypothalamic Control	12.32%	20%	162%	30
Disorders of Mineral Metabolism	8.88%	20.9%	235%	29
Complications of Medical Care, Not Elsewhere Classified	7.56%	12.96%	172%	29
Other Cerebral Degenerations	10.84%	15.64%	144%	29
Other Endocrine, Nutritional and Metabolic Diseases and Immunity Disorders	5.83%	11.17%	192%	29
Influenza	4.9%	10.68%	218%	28
Cystitis	6.48%	16.25%	251%	28
Candidiasis	10.05%	20.38%	203%	27
Other Diseases of the Nervous System	4.89%	8.66%	177%	26
Infections of Kidney	3.41%	7.09%	208%	24
Other Diseases of the Digestive System	2.49%	6.36%	256%	23
Chronic Liver Disease and Cirrhosis	4.11%	7.7%	188%	22
Essential Hypertension	2.26%	5.51%	245%	22
Intervertebral Disc Disorders	1.13%	2.9%	255%	21
Other Diseases of the Respiratory System	2.41%	5.26%	218%	21
Hypotension	3.49%	7.69%	221%	20
Spondylosis and Allied Disorders	1.27%	2.57%	202%	19
Other Mental Disorders	3.13%	10.78%	345%	16
Calculus of Kidney and Ureter	0.81%	3.38%	416%	15
Asthma	0.74%	1.79%	242%	15
Certain Adverse Effects Not Elsewhere Classified	3.68%	9.3%	253%	15
Other Disorders of Biliary Tract	1.66%	6.13%	369%	14
Nonspecific Findings on Examination of Blood	3.48%	7.45%	214%	13
Fracture of Ankle	1.9%	3.89%	204%	13
Fracture of Humerus	2.3%	5.02%	219%	12
Functional Digestive Disorders Not Elsewhere Classified	1.36%	4.17%	307%	11
Arterial Embolism and Thrombosis	2.35%	5.64%	240%	11

Principal Diagnosis Code	% with MCC Code in Benchmark	% with MCC Code in Carolinas	Carolinas Rate Relative to Benchmark	Num. of Fraud Claims at Carolinas
Other Peripheral Vascular Disease	1.95%	7.08%	362%	11
Other Disorders of [redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

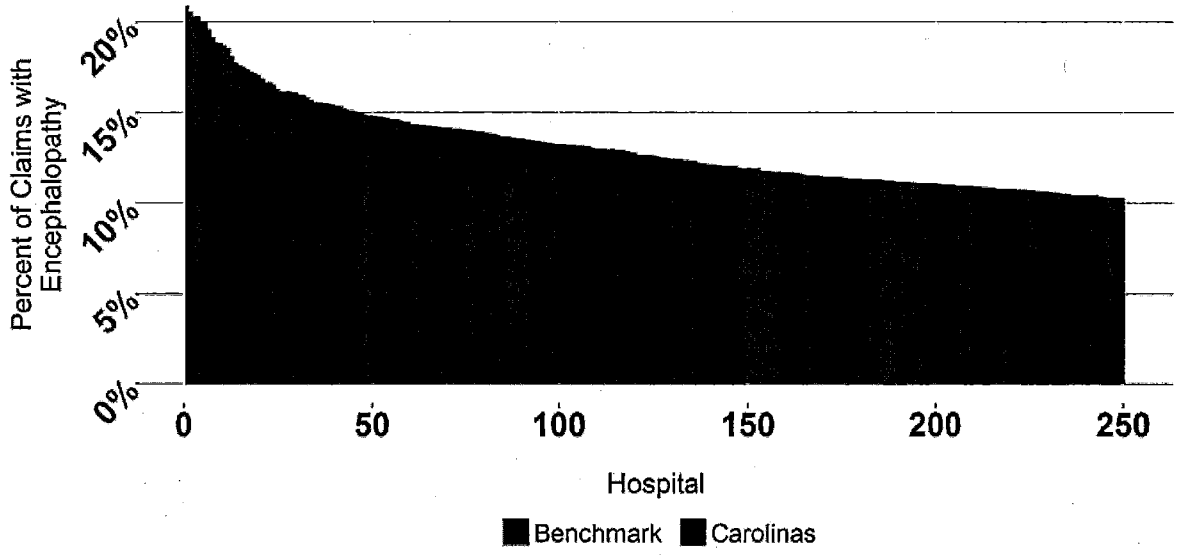
41. The following figures show just how drastic some of these patterns are when individual hospitals are analyzed, and starkly demonstrate Carolinas' widespread abuse. As shown in Figure 5, Panels A and B, Carolinas has 11 of the top 250 hospitals based on rate of encephalopathy, including 7 in the top 100. If this distribution were random, the statistical probability of having 11 of the top 250 hospitals is less than 1 in 261 thousand.

Figure 5. Rate of Encephalopathy by Hospital
The following figure plots every Provider with at least 100 claims in the above principal diagnosis code categories. 2,106 hospitals had at least 100 claims with the relevant principal diagnosis codes, as listed in Table 2. The hospitals are plotted along the x-axis in order of highest percentage of encephalopathy usage. Panel A shows all hospitals while Panel B focuses on the top 250 hospitals.

Panel A: All Hospitals

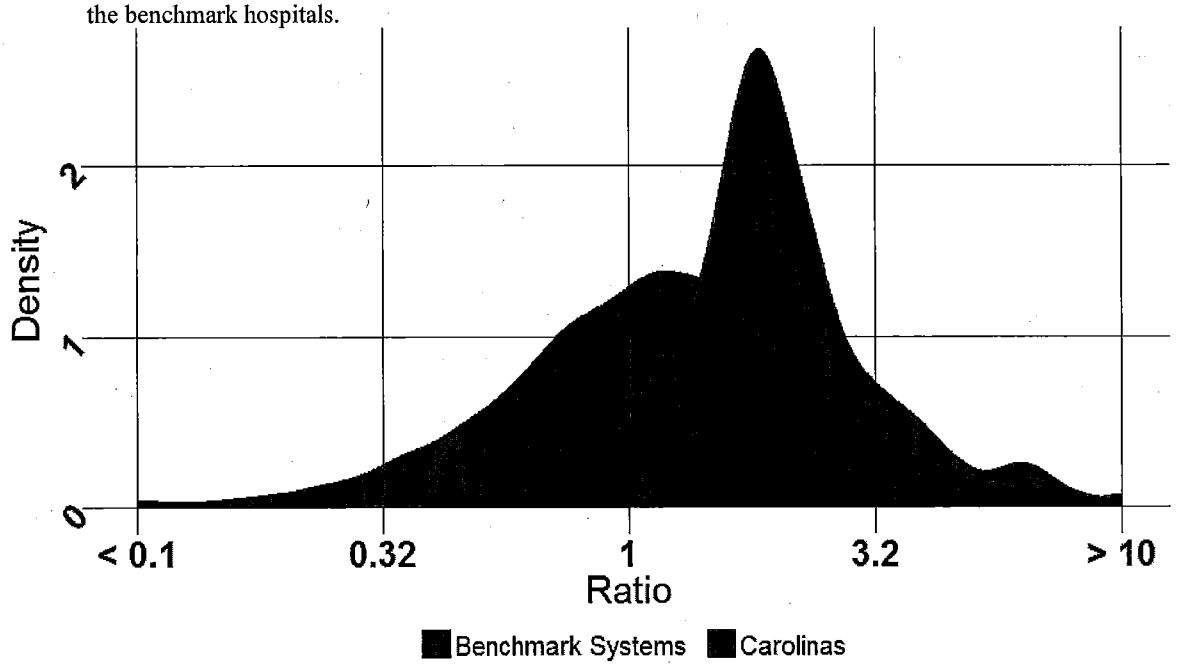


Panel B: Top 250 Hospitals



42. Figure 6 below shows that Carolinas not only used a higher rate of encephalopathy in the few categories listed above, but also across a large variety of principal diagnosis codes. Additionally, the extent to which Carolinas excessively upcoded encephalopathy on the categories listed above was not offset by a relative downcoding for other categories. As the following figure shows, Carolinas consistently upcoded encephalopathy relative to the benchmark hospitals.

Figure 6. Distribution of Patterns by Rate of Encephalopathy Relative to Benchmark Average
This figure shows the distribution of the patterns (defined as a combination of a principal diagnosis and a secondary complication) based on the ratio between Carolinas' encephalopathy usage rate (shown in red) and the usage rate at benchmark hospitals (shown in Blue). The x-axis shows the ratio of encephalopathy relative to the benchmark hospitals. A ratio of one signifies that encephalopathy is used at the same rate as the benchmark hospitals' average, and a ratio of 10 means it's used 10 times as often. The y-axis measures the relative number of patterns with each ratio. Patterns with a ratio of zero were removed for both Carolinas and the benchmark hospitals.



ii. Specific False Claims with Encephalopathy

43. The Relator has identified many specific false Medicare claims submitted by Carolinas involving encephalopathy. The following table includes 50 examples.

Table 3. False Claims made by Carolinas Using Encephalopathy

Beneficiary ID/ Claim ID	Hospital	Discharge Date	Age/ Gender/ Race	Principal Diagnosis	MCC False Claim	DRG w/ False Claim	False Claim Amount
[redacted]							

Beneficiary ID/ Claim ID	Hospital	Discharge Date	Age/ Gender/ Race	Principal Diagnosis	MCC False Claim	DRG w/ False Claim	False Claim Amount
[redacted]							

Beneficiary ID/ Claim ID	Hospital	Discharge Date	Age/ Gender/ Race	Principal Diagnosis	MCC False Claim	DRG w/ False Claim	False Claim Amount
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Beneficiary ID/ Claim ID	Hospital	Discharge Date	Age/ Gender/ Race	Principal Diagnosis	MCC False Claim	DRG w/ False Claim	False Claim Amount
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Beneficiary ID/ Claim ID	Hospital	Discharge Date	Age/ Gender/ Race	Principal Diagnosis	MCC False Claim	DRG w/ False Claim	False Claim Amount
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

B. Respiratory Failure

44. The second Misstated MCC that Carolinas used at an excessive rate is respiratory failure, which includes pulmonary insufficiency. The codes classified as respiratory failure are listed in Table 4 below. Respiratory failure is a syndrome characterized by poor gas transfer in the lungs at the alveolar and capillary levels as a result of a problem making it difficult to breathe. It can be acute or chronic. There are two types: the first and most common is hypoxemia ("oxygenation failure"), and the second type demonstrates both hypoxemia and hypercapnia ("ventilatory failure").[15] Respiratory failure can be acute and life-threatening, or chronic and manageable with modifications.[16]

[15] Dean E. Schraufnagel, *Breathing in America: Diseases, Progress, and Hope* at 207 (2010), *available at* https://goo.gl/W2Yslr.

[16] Robert S. Gold, *CMS Setting Itself up for Billions in ICD-10 Waste* (Sept. 14, 2015), *available at* https://goo.gl/smIGGz.

Table 4. Respiratory Failure Diagnosis Codes

ICD-9 Diagnosis Code	Description
5184	Acute edema of lung, unspecified
5185	Pulmonary insufficiency following trauma and surgery
51851	Acute respiratory failure following trauma and surgery
51852	Other pulmonary insufficiency not elsewhere classified following trauma/surgery
51853	Acute and chronic respiratory failure following trauma and surgery
51881	Acute respiratory failure
51884	Acute and chronic respiratory failure

45. The possible root causes are myriad, and may include poor circulation, neuromuscular disease, chronic bronchitis, COPD, obesity or drug use, an obstructing object, or an injury to the brain or spinal cord. The signs and symptoms are bluish skin, shortness of breath, labored breathing, and feeling unable to get enough air. The patient may also become very sleepy, lose consciousness, be confused, or have arrhythmia. After listening to the patient's heartbeat and lungs, a pulse oximetry test, an arterial blood gas test from a blood draw, and a chest x-ray can together help determine a proper diagnosis.[17]

46. Respiratory failure is distinguishable from conditions that have similar symptoms. Elderly patients, for example, frequently breathe shallowly during sleep. Chronic conditions such as structural and neuromuscular issues can lead to slow decline in breathing quality. Also, elderly patients who have recently undergone surgery may experience symptoms that are similar to those of respiratory failure. Though they may necessitate mechanical oxygenation assistance, it is unlikely that these conditions are sufficient for an acute respiratory failure diagnosis.[18]

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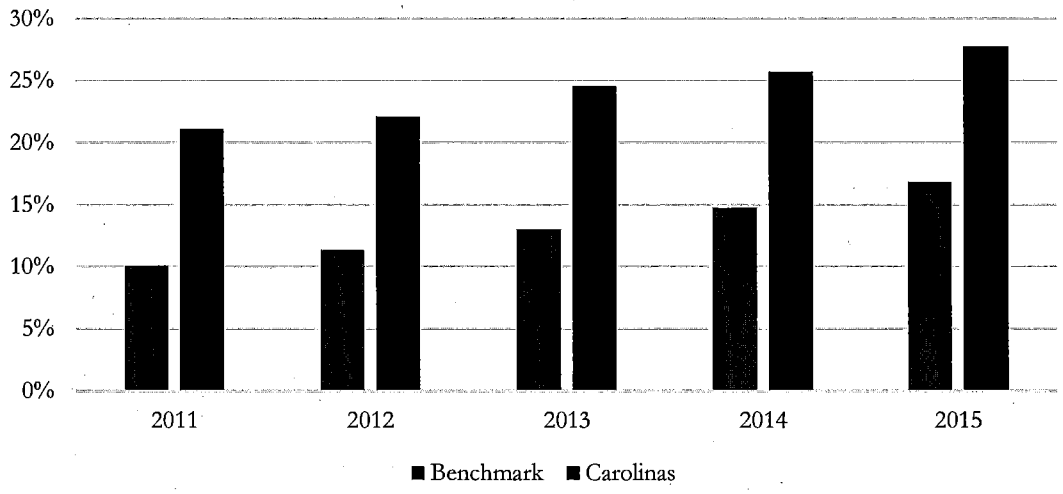
[17] Natl. Heart, Lung, and Blood Inst., *How Is Respiratory Failure Diagnosed?*, https://goo.gl/gK4jwX (last visited May 24, 2017).

[18] *See generally* Richard D. Pinson, *Revisiting Respiratory Failure*, HCPro (Jan. 2014), *available at* https://goo.gl/PSjVNv. Furthermore, patients may be placed on elective ventilators after surgery, and have respiratory failure coded anyway. CDI Talk, *Postoperative Respiratory Failure* (Dec. 24, 2105), *available at* https://goo.gl/GNbbVk.

47. Carolinas coded a significantly higher rate of respiratory failure than the benchmark hospitals. From 2011 through 2015, across the relevant codes, Carolinas coded respiratory failure nearly twice the rate at benchmark hospitals, using it on 24.21 percent of claims, versus 12.98 percent at benchmark hospitals. Additionally, Carolinas' usage of respiratory failure generally increased over time as shown in Figure 7.

Figure 7. Rate of Respiratory Failure by Year for Benchmark Hospitals and Carolinas
This figure shows the rate of respiratory failure at Carolinas and at the benchmark hospitals from 2011 through 2015, when added to the suspicious principal diagnosis codes listed in Table 5 below.



i. Specific Patterns of Fraud with Respiratory Failure

48. The following table provides a list of the principal diagnosis codes used by Carolinas to upcode with respiratory failure. Relator identified 49 principal diagnosis codes in conjunction with which Carolinas coded respiratory failure at a rate at least two times and/or three percentage points higher than the benchmark average. Only patterns that were statistically significant at the 99.9% level, meaning virtually impossible to be due to chance, are included.

Table 5. Patterns Used by Carolinas to Upcode with Respiratory Failure

Principal Diagnosis Code	% with MCC Code in Benchmark	% with MCC Code in Carolinas	Carolinas Rate Relative to Benchmark	Num. of Fraud Claims at Carolinas
Heart Failure	15.47%	29.86%	193%	2,108

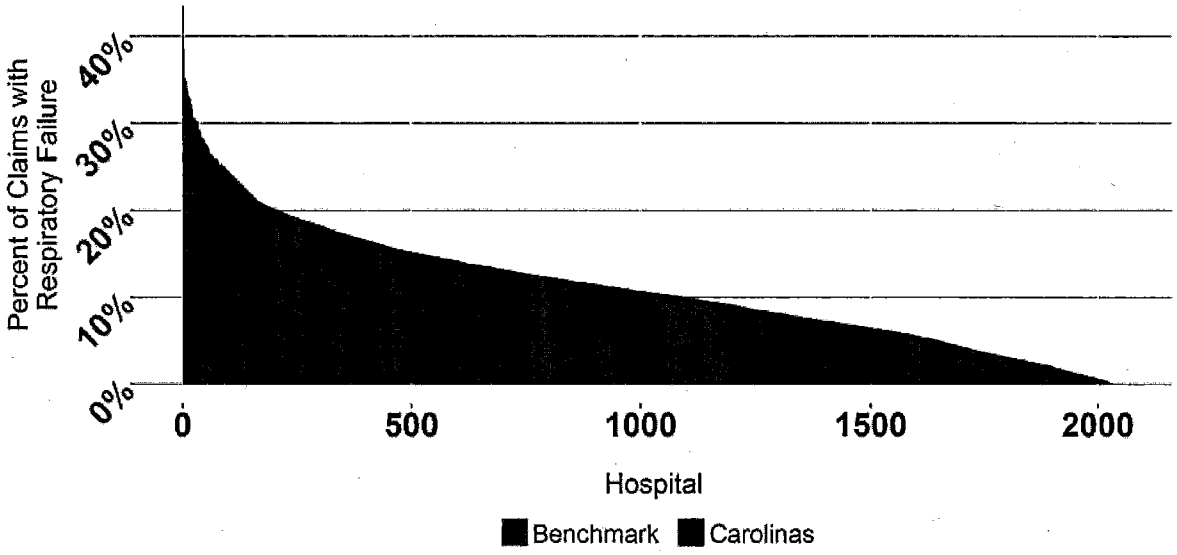
Pneumonia, Organism Unspecified	15.19%	30.87%	203%	1,464
Septicaemia	20.67%	28.71%	139%	1,367
Chronic Bronchitis	12.48%	25.76%	206%	1,030
Pneumonitis due to Solids and Liquids	22.21%	38.35%	173%	546
Other Bacterial Pneumonia	24.96%	43.71%	175%	361
Asthma	10.27%	25.54%	249%	213
Acute Pulmonary Heart Disease	12.13%	18.82%	155%	151
Other Forms of Chronic Ischemic Heart Disease	4.3%	7.77%	181%	127
Pleurisy	11.94%	24.97%	209%	121
Other Diseases of Endocardium	13.17%	24.63%	187%	109
Malignant Neoplasm of Trachea, Bronchus, and Lung	12.05%	20.18%	167%	109
Other Injury and Poisoning	5.89%	10.53%	179%	92
Other Diseases of the Respiratory System	11.67%	22.27%	191%	77
Epilepsy	6.59%	11.52%	175%	70
Other Neoplasms	5.07%	10.15%	200%	69
Hypertensive Renal Disease	4.57%	8.61%	189%	57
Influenza	11.61%	22.38%	193%	52
Postinflammatory Pulmonary Fibrosis	22.38%	43.12%	193%	45
Other Alveolar and Parietoalveolar Pneumonopathy	32.17%	60.81%	189%	42
Poisoning by Psychotropic Agents	22.33%	30.32%	136%	40
Aortic Aneurysm and Dissection	9.23%	13.04%	141%	38
Hypertensive Heart and Renal Disease	15.44%	19.79%	128%	37
Fracture of Rib(S), Sternum, Larynx, and Trachea	4.6%	12.02%	262%	37
Pneumococcal Pneumonia	18.99%	44.7%	235%	34
Fracture of Vertebral Column without Mention of Spinal Cord Injury	3.25%	6.58%	202%	34
Chronic Liver Disease and Cirrhosis	4.06%	9.31%	229%	33
Malignant Neoplasm of Stomach	7.29%	22.06%	302%	30
Other Hernia of Abdominal Cavity without Mention of Obstruction	4.86%	8.36%	172%	30

Secondary Malignant Neoplasm of Respiratory and Digestive Systems	6.36%	10.3%	162%	29
Malignant Neoplasm of Liver and Intrahepatic Bile Ducts	3.55%	13.43%	379%	28
Certain Adverse Effects Not Elsewhere Classified	12.07%	22.87%	189%	28
Other Diseases of the Circulatory System	6.03%	9.46%	157%	28
Hypertensive Heart Disease	11.72%	22.35%	191%	27
Pneumothorax	12.19%	22.01%	181%	26
Malignant Neoplasm of Pancreas	4.31%	9.8%	227%	24
Other Diseases of the Nervous System	5.58%	9.1%	163%	24
Malignant Neoplasm of Bladder	4.5%	12.41%	276%	22
Complications of Medical Care, Not Elsewhere Classified	6.95%	10.74%	155%	20
Fracture of Pelvis	1.97%	4.94%	251%	19
Other Diseases of the Digestive System	3.36%	6.53%	194%	18
Gastritis and Duodenitis	1.41%	3.95%	280%	18
Late Effects of Cerebrovascular Disease	3.63%	9.29%	256%	16
Diseases of Mitral and Aortic Valves	15.99%	30.56%	191%	16
Bronchiectasis	8.96%	16.96%	189%	14
Other Diseases of Lung	5.89%	11.3%	192%	13
Chronic Renal Failure	7%	17.65%	252%	11
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

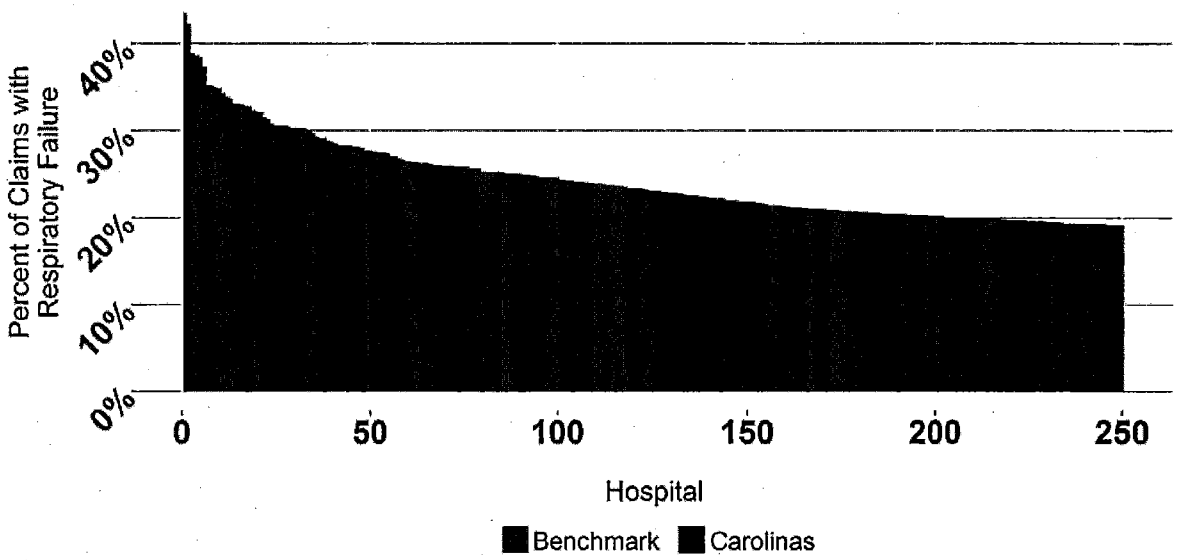
49. Figure 8 shows the extent of the fraud at Carolinas hospitals. The figure shows the rate of respiratory failure for claims in the above principal diagnosis categories. Carolinas had 14 of the top 250 hospitals based on respiratory failure usage rate for the above claims (out of more than 2,000 hospitals), including 10 in the top 100. The probability of Carolinas, randomly having 14 hospitals in the top 250 hospitals is less than 1 in 53 million.

Figure 8. Rate of Respiratory Failure by Hospital
The following figure plots every Provider with at least 100 claims in the above principal diagnosis code categories. 2,055 hospitals had at least 100 claims with the relevant principal diagnosis codes listed in Table 5. The hospitals are plotted along the x-axis in order of highest percentage of encephalopathy usage. Panel A shows all hospitals while Panel B focuses on the top 250 hospitals. The Carolinas hospitals are in red, while the benchmark hospitals are in blue.

Panel A: All Hospitals



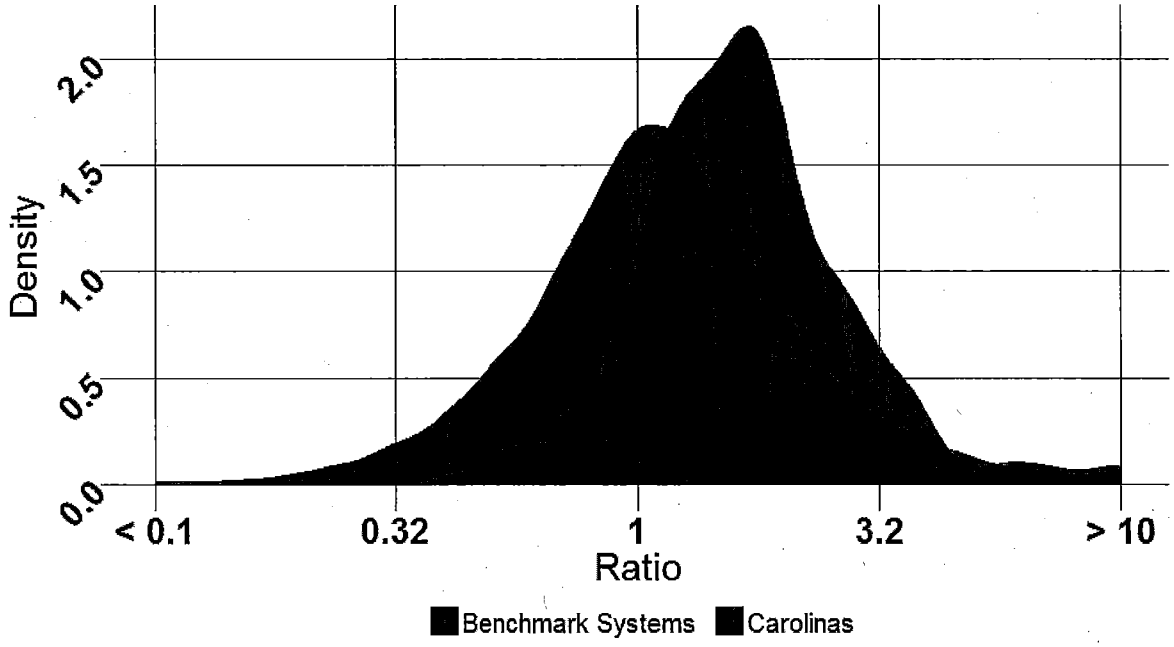
Panel B: Top 250 Hospitals



50. Figure 9 below shows that Carolinas used a higher rate of respiratory failure not just in the few categories listed above, but across a large variety of principal diagnosis codes.

Additionally, the extent to which Carolinas excessively upcoded respiratory failure on the categories listed above was not offset by a relative downcoding for other categories. As the following figure shows, Carolinas consistently upcoded respiratory failure relative to the benchmark hospitals.

Figure 9. Distribution of Patterns by Rate of Respiratory Failure Relative to Benchmark Average. This figure shows the distribution of the patterns (defined as a combination of a principal diagnosis and a secondary complication) based on the ratio between Carolinas' respiratory failure usage rate (shown in red) and the usage rate at benchmark hospitals (shown in Blue). The ratio is compared to the benchmark hospitals' national average usage rate.



ii. Specific False Claims with Respiratory Failure

51. The Relator has identified many specific false Medicare claims submitted by Carolinas involving respiratory failure. The following table includes 50 examples.

Table 6. False Claims made by Carolinas Using Respiratory Failure.

Beneficiary ID/ Claim ID	Hospital	Discharge/ Date	Age/ Gender/ Race	Principal Diagnosis	MCC False Claim	DRG w/ False Claim	False Claim Amount
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Beneficiary ID/ Claim ID	Hospital	Discharge/ Date	Age/ Gender/ Race	Principal Diagnosis	MCC False Claim	DRG w/ False Claim	False Claim Amount
[redacted]							

Beneficiary ID/ Claim ID	Hospital	Discharge/ Date	Age/ Gender/ Race	Principal Diagnosis	MCC False Claim	DRG w/ False Claim	False Claim Amount
[redacted]							

Beneficiary ID/ Claim ID	Hospital	Discharge/ Date	Age/ Gender/ Race	Principal Diagnosis	MCC False Claim	DRG w/ False Claim	False Claim Amount
[redacted]							

Beneficiary ID/ Claim ID	Hospital	Discharge/ Date	Age/ Gender/ Race	Principal Diagnosis	MCC False Claim	DRG w/ False Claim	False Claim Amount
[redacted]							

C. Heart Failure

52. The final Misstated MCC that Carolinas used to commit fraud at a higher rate was heart failure. There are six heart failure codes, listed in Table 7, that are considered MCCs. Heart failure is a condition wherein the heart does not sufficiently pump blood to the body, or return deoxygenated blood back to the heart from the body. There can be a number of underlying reasons for this condition, but two common ways this manifests are in a thicker, but inefficient, enlarged heart, or one with thinner and stiffer walls, and heart musculature.

Table 7.Heart Failure Diagnosis Codes

ICD-9 Diagnosis Code	Description
42821	Acute systolic heart failure
42823	Acute on chronic systolic heart failure
42831	Acute diastolic heart failure
42833	Acute on chronic diastolic heart failure
42841	Acute combined systolic and diastolic heart failure
42843	Acute on chronic combined systolic and diastolic heart failure

53. Stages have been developed to show the worsening stages of heart failure, I being mild and nearly unapparent, to IV aggressive and very noticeable.[19] Patients can be diagnosed with heart failure, but may be shown to be in a chronic stable condition.[20] Blood pressure is a common way to monitor the status of this condition. The systolic number, which occurs first, or in the numerator of the fraction, denotes the pressure of blood pumping to the body. The second number denotes the diastolic pressure, which signifies the ventricle relaxing wherein the blood should

[19] CHF Solutions, *Heart Failure Classifications*, https://goo.gl/uZg3aC (last visited May 24, 2017) (also noting the similar rankings by the American Heart Association, Stages A through D).

[20] Robert O. Bonow, *Performance Matters in Heart Failure*, Journal of the American College of Cardiology, vol. 63 at 131–32 (Jan. 2014), *available at* https://goo.gl/HGpleP.

return to the heart bringing carbon dioxide to the lungs, and ready to receive oxygen and be pumped back out again.

54. Heart failure may be subject to manipulation. Secondary codes (not the primary reason a patient is admitted, but a co-morbidity or a complicating condition) can merit more money for the hospital per patient than when heart failure is coded as a primary indicator.[21] After a patient is admitted, heart failure may be easily coded if the patient has an elevated blood pressure reading due to another condition. One key possibility for consideration of manipulation in coding heart failure is that known protocols to both test systolic function, and to treat systolic problems with recommended drugs are surprisingly underutilized.[22] While other explanations may be possible, it seems reasonable to conclude well-intentioned providers would have no reason not to act according to these established protocols, and release data to show they are acting according to guidelines.

55. As shown in Figure 10, Carolinas coded a significantly higher rate of heart failure than the benchmark hospitals, and the rate increased over time. From 2011 through 2015, across the relevant claims, benchmark hospitals used heart failure on 14.46 percent of claims, while Carolinas used it on 19.68 percent of claims.

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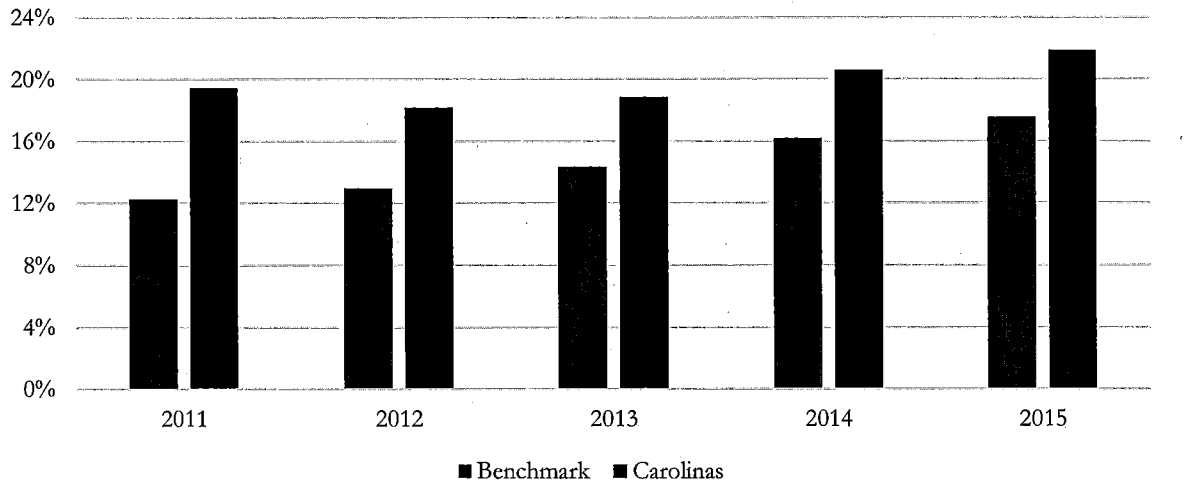
[21] Guijing Wang, *Costs of Heart Failure-Related Hospitalizations in Patients Aged 18 to 64 Years*, American Journal of Managed Care, vol. 16 at 769–76 (Oct. 2010), *available at* https://goo.gl/fyo8SM.

[22] Robert O. Bonow, *Performance Matters in Heart Failure*, Journal of the American College of Cardiology, vol. 63 at 131–32 (Jan. 2014) ("…glaring underuse of ACE inhibitors/ARBs in patients with LV systolic dysfunction … Given the significant link between ACE inhibitor/ARB therapy and improved survival in this study, consistent with … guidelines recommendations, the underperformance on this measure represents an egregious gap in care that provides an unsettling wake-up call…").

Figure 10. Rate of Heart Failure by Year for Benchmark Hospitals and Carolinas
This figure shows the rate of heart failure at Carolinas and at the benchmark hospitals from 2011 through 2015, when added to the suspicious principal diagnosis codes listed in Table 8 below.



i. Specific Patterns of Fraud with Heart Failure

56. The following table provides a list of the principal diagnosis codes used by Carolinas to upcode with heart failure. Relator identified 14 principal diagnosis codes in conjunction with which Carolinas coded heart failure at a rate at least two times and/or at three percentage points higher than the benchmark average. Only patterns that were statistically significant at the 99.9% level, meaning virtually impossible to be due to chance, are included.

Table 8. Patterns Used by Carolinas to Upcode with Heart Failure

Principal Diagnosis Code	% with MCC Code in Benchmark	% with MCC Code in Carolinas	Carolinas Rate Relative to Benchmark	Num. of Fraud Claims at Carolinas
Cardiac Dysrhythmias	11.48%	17.53%	153%	569
Acute Myocardial Infarction	18.43%	24.2%	131%	362
Pneumonitis due to Solids and Liquids	8%	13.09%	163%	172
Hypertensive Heart and Renal Disease	73.21%	88.76%	121%	133
Other Bacterial Pneumonia	9.59%	13.46%	140%	74
Other Diseases of Endocardium	16.44%	21.79%	133%	51
Conduction Disorders	7.14%	10.96%	154%	31
Other Disorders of Stomach and Duodenum	4.1%	7.82%	191%	18

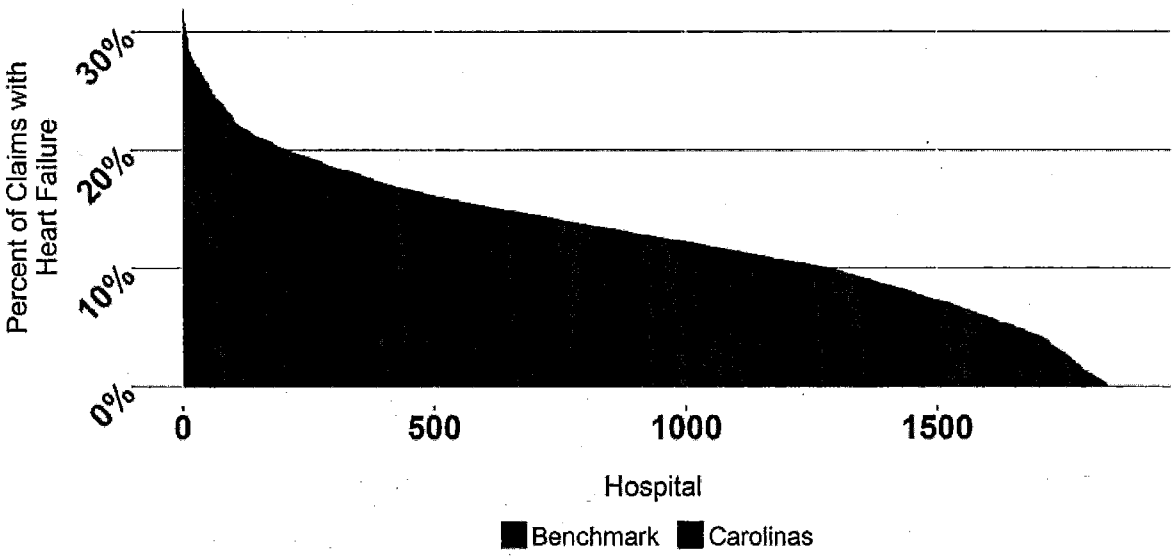
Poisoning by Central Nervous System Stimulants	4.87%	14.39%	296%	13
Chronic Renal Failure	9.77%	21.57%	221%	12
Aplastic Anemia	2.3%	6.87%	298%	12
[redacted]				

57. The following figures show just how drastic some of these patterns are when individual hospitals are analyzed, and starkly demonstrate Carolinas' widespread abuse. As shown in Figure 11, Panels A and B, Carolinas had 9 of the top 250 hospitals with the highest rate of heart failure.[23] The probability of having 9 out of 18 hospitals in the top 250 occurring due to random chance is less than 1 in 5 thousand.

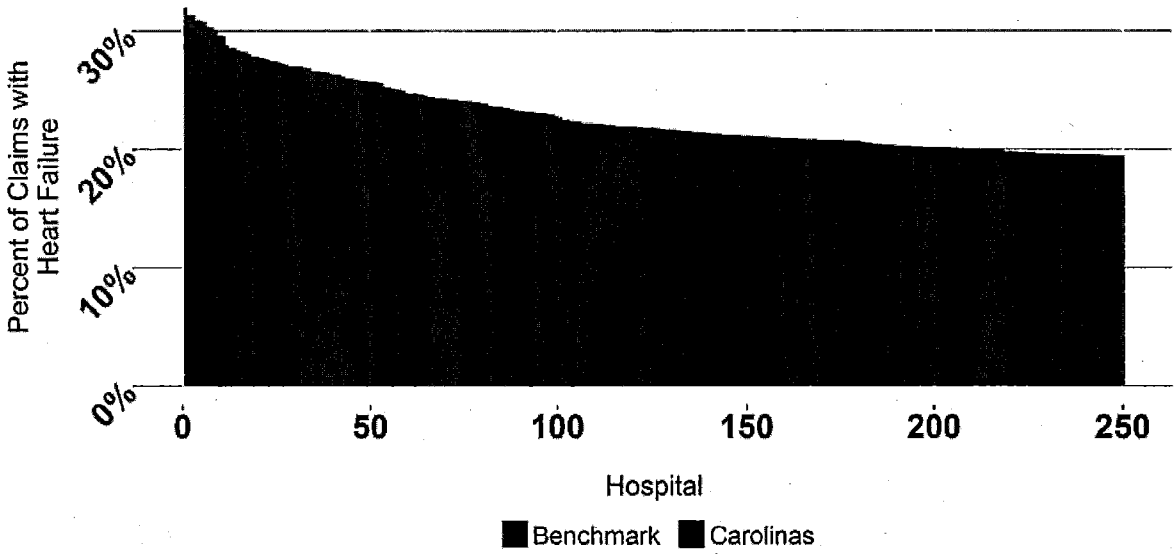
[23] One Carolinas hospital had fewer than 100 claims for the relevant patterns for heart failure, so it was not included in the distribution of hospitals by rate.

Figure 11. Rate of Heart Failure by Hospital
The following figure plots every Provider with at least 100 claims in the above principal diagnosis code categories. 1,868 hospitals had at least 100 claims for the relevant patterns listed in Table 8. The hospitals are plotted along the x-axis in order of highest percentage of encephalopathy usage. Panel A shows all hospitals while Panel B focuses on the top 250 hospitals. Benchmark hospitals are in blue and Carolinas hospitals are in red.

Panel A: All Hospitals



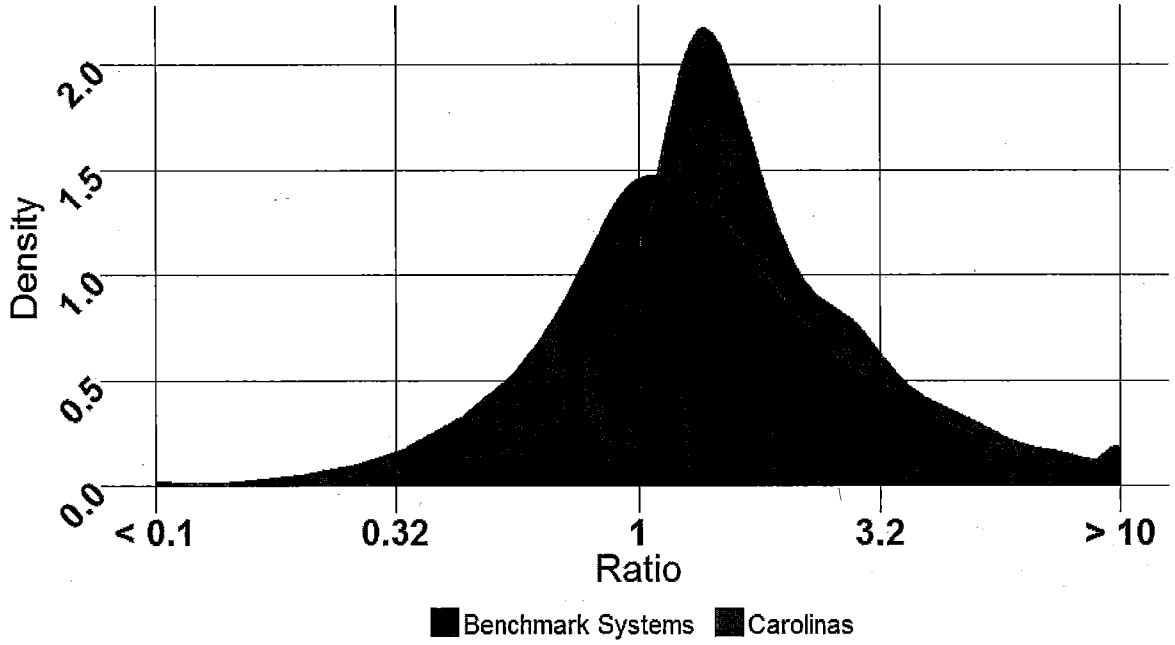
Panel B: Top 250 Hospitals



58. Figure 12 below shows that Carolinas used a higher rate of heart failure not just in the few categories listed above, but across a large variety of principal diagnosis codes.

Additionally, the extent to which Carolinas excessively upcoded heart failure on the categories listed above was not offset by a relative downcoding for other categories. As the following figure shows, Carolinas consistently upcoded heart failure relative to the benchmark hospitals.

Figure 12. Distribution of Patterns by Rate of Heart Failure Relative to Benchmark Average. This figure shows the distribution of the patterns (defined as a combination of a principal diagnosis and a secondary complication) based on the ratio between Carolinas' heart failure usage rate (shown in red) and the usage rate at benchmark hospitals (shown in Blue). The ratio is compared to the benchmark hospitals' national average usage rate.



ii. Specific False Claims with Heart Failure

59. The Relator has identified many specific false Medicare claims submitted by Carolinas involving heart failure. The following table includes 50 examples.

Table 9. False Claims Made by Carolinas Using Heart Failure.

Beneficiary ID/ Claim ID	Hospital	Discharge Date	Age/ Gender/ Race	Principal Diagnosis	MCC False Claim	DRG w/ False Claim	False Claim Amount
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Beneficiary ID/ Claim ID	Hospital	Discharge Date	Age/ Gender/ Race	Principal Diagnosis	MCC False Claim	DRG w/ False Claim	False Claim Amount
[redacted]							

Beneficiary ID/ Claim ID	Hospital	Discharge Date	Age/ Gender/ Race	Principal Diagnosis	MCC False Claim	DRG w/ False Claim	False Claim Amount
[redacted]							

Beneficiary ID/ Claim ID	Hospital	Discharge Date	Age/ Gender/ Race	Principal Diagnosis	MCC False Claim	DRG w/ False Claim	False Claim Amount
[redacted]							

Beneficiary ID/ Claim ID	Hospital	Discharge Date	Age/ Gender/ Race	Principal Diagnosis	MCC False Claim	DRG w/ False Claim	False Claim Amount
[redacted]							

2. Other Items for Consideration

60. To further demonstrate Carolinas' fraud, Relator has analyzed whether the statistically aberrant upcoding described above could be attributed to a variety of other factors. First, Relator ran a fixed effect linear regression model. Second, Relator ran a Regression of Discontinuity Design (RDD) to quantify the impact of Carolinas entering into a management agreement with a hospital. Third, Relator analyzed a subset of claims where Carolinas and the benchmark hospitals shared a common physician. Fourth, Relator analyzed a subset of claims where Carolinas and a benchmark hospital shared common patients. Finally, Relator analyzed the upcoding rate for Carolinas and benchmark hospitals in the same state for both metropolitan and non-metropolitan areas. As discussed further below, this analysis proves that the upcoding can be

directly attributed to Carolinas' fraud as opposed to external factors, suggesting the upcoding was known by the system and was intentional.

A. Fixed Effect Linear Regression Model

61. The Relator used a fixed effect linear regression model to calculate the specific impact Carolinas had on the abuse of a Misstated MCC code after controlling for other characteristics. Specifically, Relator added a fixed effect control variable for Carolinas to the regression model, along with a variety of controls, and the coefficient for Carolinas represents the incremental amount of upcoding committed by Carolinas beyond what could be explained by other variables.

62. Using this methodology, Relator controlled for the basic patient characteristics in its data, such as the age, gender, and race. Relator also used county-level demographic data, such as unemployment rate, percent of population without a high school diploma, median income, and the rural-urban continuum codes from the Department of Agriculture as control variables.[24] Lastly, Relator controlled for the principal diagnosis by grouping together principal diagnosis codes in a manner consistent with its statistical analysis, as well as discharge status the length of stay, which allowed Relator to estimate the severity of the patient's condition. Equation 1 shows the fixed effect linear regression model used by Relator.

[24] The Rural-Urban Continuum Codes measure whether each county is in a metro or non-metro area, and reflect the overall size of the metropolitan area.

Equation 1. Relator's Fixed Effect Linear Regression Model.
The following equation presents the fixed effect linear regression model used by Relator. The variable of interest is β_1, which is the coefficient for Carolinas. Panel A provides the equation, and Panel B explains the variables included in the model. The *i* refers to a specific claim and *j* refers to the potential options for the categorical variables.

Panel A – Regression Model

$$MCC_i = \beta_0 + \beta_1 . Carolinas_i + \sum_{j=2}^{4} \beta_{3j} . Season_{ij} + \sum_{j=2}^{6} \beta_{4j} . Age_{ij} + \sum_{j=2}^{7} \beta_{5j} . Race_{ij} + \sum_{j=2}^{m} \beta_{6j} . Cat_{ij} + \sum_{j=2}^{9} \beta_{7j} . RUCC_{ij} + \beta_8 . Male_i + \beta_9 . pov_i + \beta_{10} . unemp_i + \beta_{11} . Inc_i + \beta_{12} . LOS_i + \sum_{j=2}^{4} \beta_{13j} . Discharge_{ij} + \beta_{14} . hs_i + \varepsilon_i$$

Panel B – Explanation of Variables

Variable	Description
$\boldsymbol{\beta_0}$	Intercept
$\boldsymbol{MCC_i}$	Whether the MCC was included on the claim.
$\boldsymbol{Carolinas_i}$	Whether the claim was at Carolinas
$\boldsymbol{Season_{ij}}$	Season control variable for the claim (Winter, Spring, Summer, Fall)
$\boldsymbol{Age_{ij}}$	Patient's age on the claim (6 age groups)
$\boldsymbol{Race_{ij}}$	Patient's race on the claim (7 race categories)
$\boldsymbol{Cat_{ij}}$	Claim principal diagnosis category
$\boldsymbol{RUCC_{ij}}$	Patient's rural urban continuum code based on the county.
$\boldsymbol{Male_i}$	Patient's gender.
$\boldsymbol{pov_i}$	County poverty rate in 2014.
$\boldsymbol{unemp_i}$	County unemployment rate in 2014
$\boldsymbol{Inc_i}$	County log median income in 2014
$\boldsymbol{LOS_i}$	The patient's log length of stay at the hospital for claim *i*
$\boldsymbol{Discharge_{ij}}$	The patient's discharge status group (severe/moderate/ok/unknown) for claim *i*
$\boldsymbol{hs_i}$	County percentage of individuals without a high school degree in 2010
$\boldsymbol{\varepsilon_i}$	Error term

63. As shown in Table 10, after controlling for other factors, the Carolinas coefficient for the Misstated MCCs is 0.1030. This means that 10.30 percent of Carolinas patients are coded with one of the Misstated MCCs who would not have been coded as such at a benchmark hospital. Given the baseline usage rate of the Misstated MCCs at the benchmark hospitals is 12.23 percent, Carolinas' calculated rate of Misstated MCCs is 21.64 percent. In other words, Carolinas' usage rate of the Misstated MCCs is 213% that of benchmark hospitals, even after controlling for basic patient characteristics. This result is statistically significant with more than 99.9999 percent confidence—i.e., almost certainly not random.

64. Not surprisingly, the individual coefficients for encephalopathy, respiratory failure, and heart failure are also large in magnitude. Carolinas' usage rate for encephalopathy was 237% of the benchmark, respiratory failure was 206%, and heart failure was 228%.

65. By controlling for these characteristics, the regression model allows the Relator to isolate the impact being treated at Carolinas would have on a patient's probability of having these major complications. For example, if you have two similar patients (same principal diagnosis, age, gender, and race) from the same county, with the same principal diagnosis, discharge status, and length of stay, the patient would be about 2.4 times more likely to be diagnosed with encephalopathy at Carolinas than at benchmark hospitals. Alternatively, if patients were consistently sicker at Carolinas (as demonstrated by a longer length of stay and a more severe discharge status), the regression coefficient still accounts for this increased patient severity and the Carolinas fixed-effect coefficient still provides the marginal increase in probability of being diagnosed with the major complications when treated at Carolinas versus a benchmark hospital.

66. Taken together, Relator's regression analysis shows that the Misstated MCC upcoding was not due to unique patient demographic or health characteristics, but is specifically caused by Carolinas.

Table 10. Results of Fixed Effect Linear Regression Model
Relator used a linear regression to analyze approximately 16.7 million claims at Carolinas and benchmark hospitals. The results are presented in the following table. The coefficient is listed first and the p-value is in parenthesis, which represents the statistical significance of the coefficient. A lower p-value means the result is more statistically significant. Coefficients were not included for categorical variables. The Carolinas coefficient is added to the benchmark rate to get the expected Carolinas upcoding rate after including controls.

	Any of the 3 Major Compli-cations	Enceph-alopathy	Respiratory Failure	Heart Failure
Poverty Rate	-0.0014 (<0.0001)	-0.0009 (<0.0001)	-0.0016 (<0.0001)	0.0001 (0.5513)
Unemployment	0.0006	0.0019	-0.0016	0.0016

Rate	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Log (Median Income)	-0.0650 (<0.0001)	-0.0461 (<0.0001)	-0.0789 (<0.0001)	-0.0003 (0.8920)
No High School Diploma Rate	-0.0020 (<0.0001)	-0.0015 (<0.0001)	-0.0018 (<0.0001)	-0.0014 (<0.0001)
Log (Length of Stay)	0.0924 (<0.0001)	0.0424 (<0.0001)	0.1082 (<0.0001)	0.1101 (<0.0001)
Intercept	0.4369 (0.3140)	0.4313 (0.0706)	0.8377 (0.0677)	-0.1422 (<0.0001)
Season Control Variables	Yes	Yes	Yes	Yes
Age Control Variables	Yes	Yes	Yes	Yes
Sex Control Variables	Yes	Yes	Yes	Yes
Race Control Variables	Yes	Yes	Yes	Yes
Discharge Status Control	Yes	Yes	Yes	Yes
Principal Diagnosis Category	Yes	Yes	Yes	Yes
RUCC Control	Yes	Yes	Yes	Yes
Carolinas Coefficient	0.1030 (<0.0001)	0.0669 (<0.0001)	0.1115 (<0.0001)	0.0718 (<0.0001)
Benchmark Average	12.23%	6.41%	12.98%	14.46%
Carolinas Rate	**22.53%**	**13.10%**	**24.13%**	**21.64%**
Carolinas Relative Effect	**184.22%**	**204.37%**	**185.90%**	**149.65%**

B. Analysis of a New Management Agreement

67. Were the upcoding practices *caused* by Carolinas management? Causal methods are often used in economics, finance and other applications to assess the extent to which an effect

can be identified to be caused, and not merely associated with other explanatory variables.[25] In this case, one can use causal methods to understand if the excessive use of Misstated MCC coding is simply associated or if it is in fact caused by Carolina Management practices. A common causal econometric methodology is the Regression of Discontinuity Design (RDD). This methodology can be used when there is a sudden change in the effect that one wishes to examine.[26]

68. In this case, the technique can be used to examine the extent to which Carolinas management practices influenced upcoding. The coding practices of a hospital before it was managed by a specific hospital system can be compared to its coding practices after it was acquired by the specific hospital system. One defendant, Moses H. Cone Memorial Hospital (Moses), entered into a management services agreement with Carolinas for Carolinas to help manage the hospital. The agreement was signed on June 5, 2012, and became effective October 1, 2012.[27] Prior to the agreement, Moses was unaffiliated with Carolinas. The timing of this agreement presents the relator an opportunity to assess the impact that affiliation with Carolinas has on a hospital's coding behavior using the discontinuity associated with the sudden shift of management at Moses Hospital.

69. First, relator examined the rate of the three Misstated MCCs at Moses before and after its affiliation with Carolinas and compared it to the rate of the Misstated MCCs at Carolinas

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[25] "The notion of ceteris paribus—that is, holding all other (relevant) factors fixed—is at the crux of establishing a causal relationship." Jeffrey Wooldrige, *Econometric Analysis of Cross Section and Panel Data*, at 3 (The MIT Press 2d ed. 2010).

[26] Regression of Discontinuity Design "captures *causal effects* by distinguishing the nonlinear and discontinuous function from the smooth and (in this case) linear function." Joshua D. Angrist, Angrist, Joshua, and Jörn-Steffen Pischke, *Mostly harmless econometrics: An empiricist's companion*, at 190 (Princeton University Press 1st ed. 2008).

[27] Triad Business Journal, *Cone Health, Carolinas HealthCare System enter into management agreement* (June 12, 2012), *available at* https://goo.gl/X7RTri.

and the benchmark during the same period. As shown in Figure 13, prior to entering into the agreement with Carolinas, Moses's rate of the Misstated MCCs (in red) is similar to the benchmark average (in blue), and significantly lower than Carolinas (in black). However, as soon as the agreement was signed, Moses' usage of the three Misstated MCCs steadily increased until it was consistent with the rate at Carolinas, and even often exceeded the rate of misstated MCCs throughout much of 2015.

70. Relator conducted further analysis to show that the change in behavior was caused by the affiliation as opposed to other factors, such as changing patient health and demographics, by using Regression of Discontinuity Design (RDD). Here Relator can quantify the extent to which

the increase in the behavior is attributed to the change in management and can control for other possible explanations by isolating the effect of the change in management on the coding practices. Figure 14 shows the graphical results of the RDD analysis.

71. The RDD shows that there is a significant jump in the rate of Misstated MCCs after the management agreement goes into full effect. The graph is based on the RDD formula shown in Panel A of Equation 2 below, which is a simple RDD without variable controls. This allows us to compare differences in coding behavior for patients at Moses before and after the management

change *relative to the benchmark behavior.* The advantage of this approach is that it allows Relator to identify and quantify not only the short-term effect of management change on the immediate increase in coding misstated codes but also the long-term effect in the post-contract trend of upcoding. Relator's RDD analysis shows the rate of Misstated MCCs increased on average 9.23% as a result of the management agreement, which also reflects the more significant upward trend in MCC usage at Moses after the acquisition. The p-value calculated for this percentage is less than 0.00001 which means that Relator is more than 99.999% confident that the management agreement caused an increase in the rate of MCC upcoding.

72. Relator also ran a RDD while controlling for a variety of patient characteristics, the equation of which is located in Panel B of Equation 2 below. This allowed relator to control for patient characteristics such as age, race, and gender, claim characteristics such as the principal diagnosis, and regional characteristics such as income and unemployment levels in the patient's home county. Such an analysis allowed the Relator to identify the amount of the increase in MCC rate than can be attributed to the management services agreement while controlling for possible changes in the composition of patients before and after the acquisition. As such, the variable of interest represents the incremental amount of average MCC upcoding that can be attributed to the management change beyond what could be explained by the other variables. After controlling the other variables, the effect of the management services agreement was estimated to be 9.40%, meaning the new management agreement caused a 9.40% average increase in the rate of misstated MCCs. Even using overly conservative controls, the p-value calculated for this number is less than 0.00001 which means that Relator is more than 99.999% confident that management agreement caused an increase in the rate of MCC upcoding.

Equation 2. Relator's Regression of Discontinuity Design Model.
The following equations present the RDD model used by relator. The aggregate short-run and long-run effect of management change on the level of upcoding at Moses is estimated through the variable β_{Moses}. This represents the jump in the rate of MCC coding while assuming that Moses' rate of MCCs will continue to increase at the same rate as the benchmark (as represented by the slope of the lines in Figure 14). Panel A provides the simple RDD equation without additional controls and Panel B provides the RDD model with controls. In the following equations, i refers to a specific claim and j refers to the potential options for the categorical variables. The index t represents one of the 53 months used in the RDD analysis (from January 2011 through September 2015 while excluding the time period between when the contract was signed and became effective). The outcome variable MCC_{it} in Panel A is the monthly average MCC rate at Moses in month t, whereas the outcome variable MCC_{it} in Panel B is the binary value for existence or non-existence of MCC in a specific claim i at Moses in month t.

Panel A – Simple RDD

$$MCC_t = \beta_0 + \beta_{Moses}.Contract_t + (\hat{\beta}^{Pre}_{Bench}).(t - t_c) + (\hat{\beta}^{Post}_{Bench} - \hat{\beta}^{Pre}_{Bench}).Contract_t.(t - t_c) + \varepsilon_t$$

Panel B – RDD with Additional Controls

$$MCC_{it} = \beta_0 + \beta_{Moses}.Contract_t + (\hat{\beta}^{Pre}_{Bench}).(t - t_c) + (\hat{\beta}^{Post}_{Bench} - \hat{\beta}^{Pre}_{Bench}).Contract_t.(t - t_c) + \sum_{j=2}^{4}\beta_{3j}.Season_{ij} + \sum_{j=2}^{6}\beta_{4j}.Age_{ij} + \sum_{j=2}^{7}\beta_{5j}.Race_{ij} + \sum_{j=2}^{m}\beta_{6j}.Cat_{ij} + \sum_{j=2}^{9}\beta_{7j}.RUCC_{ij} + \beta_8.Male_i + \beta_9.pov_i + \beta_{10}.unemp_i + \beta_{11}.Inc_i + \beta_{12}.LOS_i + \sum_{j=2}^{4}\beta_{13j}.Discharge_{ij} + \beta_{14}.hs_i + \varepsilon_i$$

73. In Equation 2, $Contract_t$ is a binary variable which is equal to 1 if it is after the contract was effective and is equal to 0 if it's before the contract was signed. The contract variable is interacted on the time variable and the System variable separately to control for the change in slope of the benchmark pre and post contract fitted lines. Essentially, Relator is assuming that the upcoding trend at Moses *would have been* the same as the benchmark's upcoding trend both before and after the agreement, had the agreement not been signed. Relator controlled for the pre and post-contract trends by running separate regressions on the benchmark data in order to find $\hat{\beta}^{Post}_{Bench}$ and $\hat{\beta}^{Pre}_{Bench}$, which are the slopes of the post and pre-contract blue fitted lines in Figure 14. The control variables in the Panel B of Equation 2 are the same as those described in Equation 1 on page 48. The variable of interest in the Regression of Discontinuity Design is β_{Moses}, which is the coefficient of the dummy variable $Contract_t$ that compares Moses' post and pre-contract behaviors compared to the benchmark. Essentially, this variable quantifies the effect of the contract

on the rate of Misstated MCCs after controlling for the time trend (and other variables in the case of the RDD model in Panel B of Equation 2).

C. Doctor Level Analysis

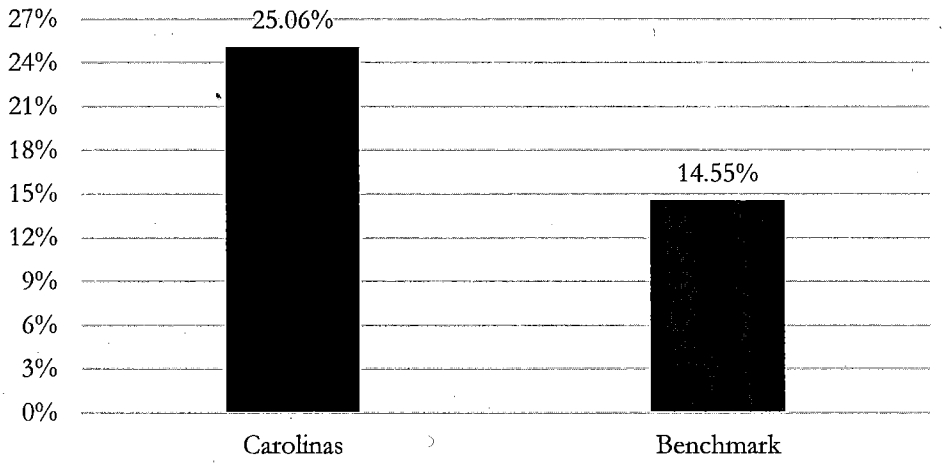
74. Relator's analysis also excludes the possibility that Carolinas' upcoding was the result of its doctors being more likely to code encephalopathy, respiratory failure, and heart failure based on experience, specialty, or other tendencies. To test for this, Relator analyzed a subset of claims involving doctors that treated patients at both Carolinas and a benchmark hospital.[28]

75. As shown in Figure 15, when considering only claims for doctors with at least 10 claims at both Carolinas and benchmark hospitals, the use of encephalopathy, respiratory failure, and heart failure was still significantly higher at Carolinas. Between 2011 and 2015, doctors used one of the Misstated MCCs on 25.06 percent of claims while treating patients at Carolinas, but on only 14.55 percent of claims when treating patients at benchmark hospitals.

[28] In this analysis, Relator considered all common doctors with at least one relevant MCC code in the relevant claims. Doctors without an MCC at Carolinas or the Benchmark were excluded from this analysis. Including these doctors would have almost no impact on the ratios for each of these disease categories.

Figure 15. Rate of Any of The Misstated MCCs at Carolinas Relative to Benchmark for Claims with Common Doctors

The following figure includes any claims for common doctors between Carolinas and a Benchmark hospital from 2011 through 2015. Even with doctors that work at both hospitals, Carolinas used one of the Misstated MCCs on 25.06 percent of claims, while those same doctors only use one of the Misstated MCCs on 14.55 percent of claims while at the benchmark hospitals. The analysis is based on 153 doctors with 10 claims at Carolinas and 10 claims at a benchmark hospital. In total these doctors had 20,477 claims at Carolinas and 19,686 claims at benchmark hospitals.

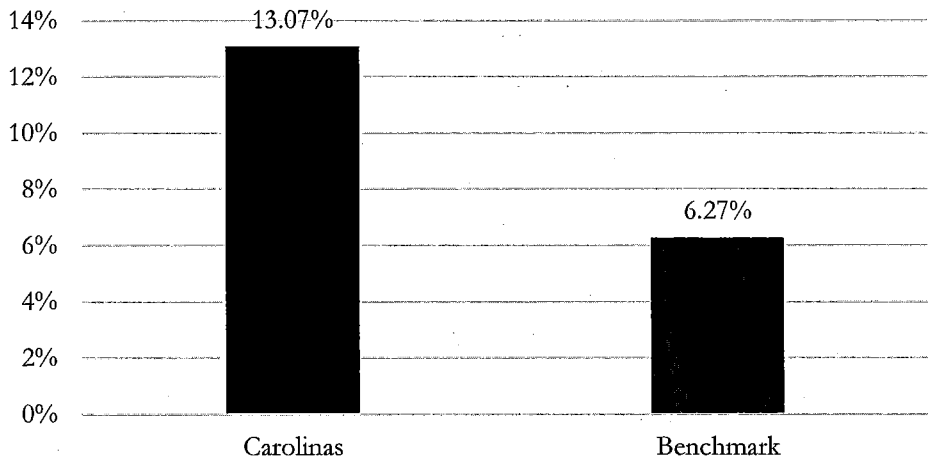


76. For doctors that serve at both hospitals, the rate of encephalopathy at Carolinas was 13.07 percent, while the rate of encephalopathy at benchmark hospitals was 6.27 percent, as demonstrated in Figure 16 below. This suggests that a doctor was more than twice as likely to diagnose a patient with encephalopathy when treating the patient at Carolinas than when the same doctor was treating a patient at a benchmark hospital.[29]

[29] This general trend still holds when looking at any doctor that has at least one claim at Carolinas and one claim at a benchmark hospital. Specifically, the rate of encephalopathy is 13.02% at Carolinas and 6.36% at benchmark hospitals.

Figure 16. Rate of Encephalopathy at Carolinas Relative to Benchmark for Claims with Common Doctors

The following figure includes any claims for doctors with at least 10 claims at Carolinas and 10 claims at a Benchmark hospital from 2011 through 2015. Even with doctors that work at both hospitals, Carolinas had an encephalopathy rate of 13.07 percent, while those same doctors only use encephalopathy on 6.27 percent of claims while at the benchmark hospitals. The analysis is based on 126 doctors with 10 claims at Carolinas and 10 claims at a benchmark hospital. In total these doctors had 13,905 claims at Carolinas and 13,421 claims at benchmark hospitals.

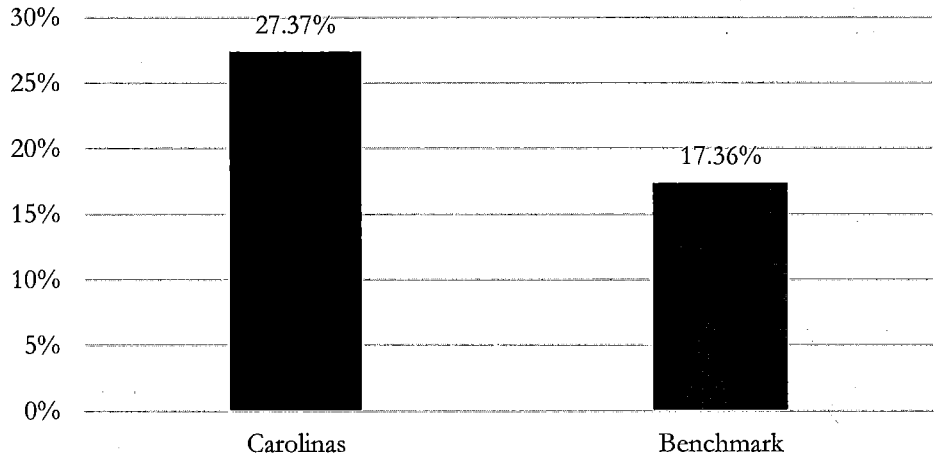


77. For doctors that serve at both hospitals, the rate of respiratory failure at Carolinas was 27.37 percent, while the rate of respiratory failure at benchmark hospitals was 17.36 percent, as demonstrated in Figure 17 below.[30]

[30] This general trend still holds when looking at any doctor that has at least one claim at Carolinas and one claim at a benchmark hospital. Specifically, the rate of respiratory failure is 26.91% at Carolinas and 16.97% at benchmark hospitals.

Figure 17. Rate of Respiratory Failure at Carolinas Relative to Benchmark for Claims with Common Doctors

The following figure includes any claims for doctors with at least 10 claims at Carolinas and 10 claims at a Benchmark hospital from 2011 through 2015. Even with doctors that work at both hospitals, Carolinas had a respiratory failure rate of 27.37 percent, while those same doctors only use respiratory failure on 17.36 percent of claims while at the benchmark hospitals. The analysis is based on 114 doctors with 10 claims at Carolinas and 10 claims at a benchmark hospital. In total these doctors had 10,125 claims at Carolinas and 9,307 claims at benchmark hospitals.

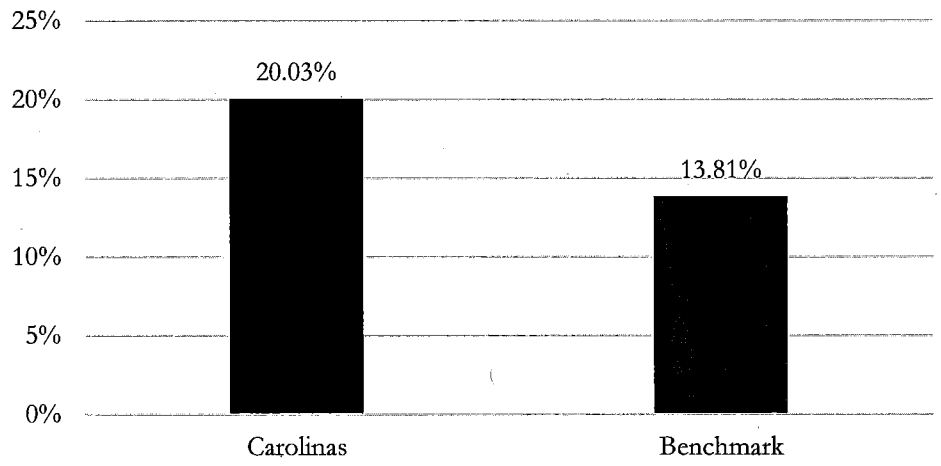


78. For doctors that serve at both hospitals, the rate of heart failure at Carolinas was 20.03 percent, while the rate of heart failure at benchmark hospitals was 13.81 percent, as demonstrated Figure 18 in below.[31]

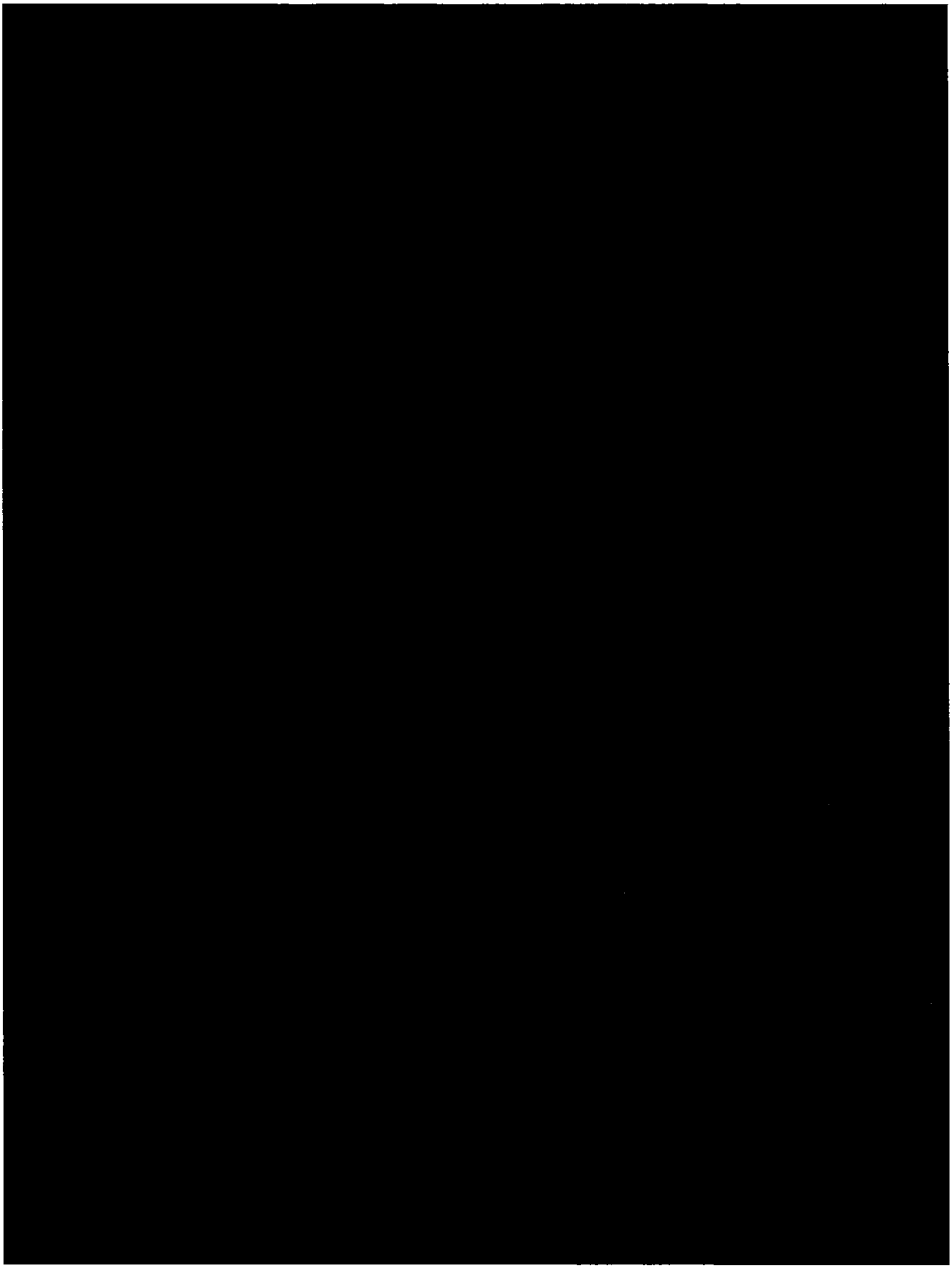
[31] This general trend still holds when looking at any doctor that has at least one claim at Carolinas and one claim at a benchmark hospital. Specifically, the rate of Heart Failure is 26.91% at Carolinas and 16.97% at benchmark hospitals.

Figure 18. Rate of Heart Failure at Carolinas Relative to Benchmark for Claims with Common Doctors

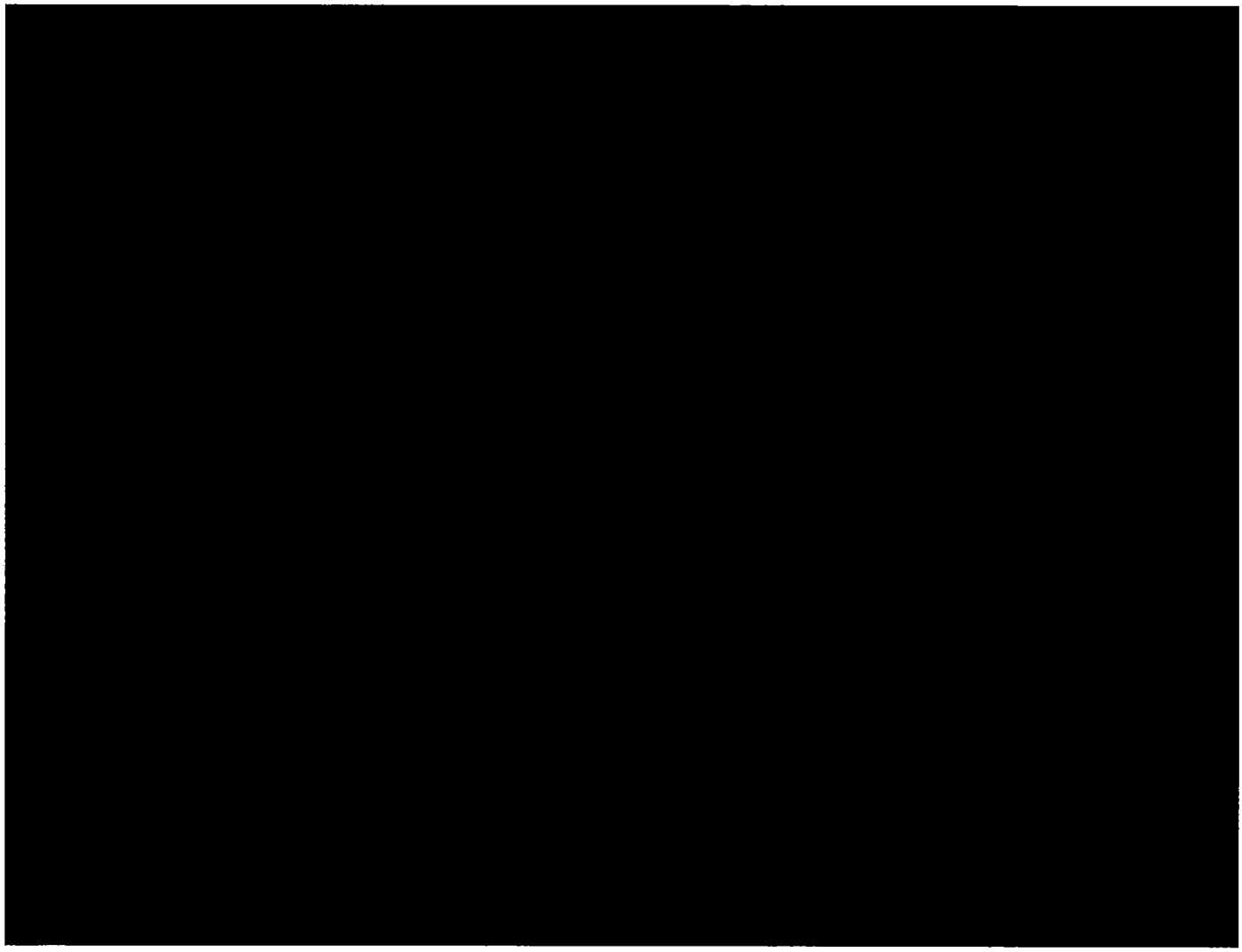
The following figure includes any claims for doctors with at least 10 claims at Carolinas and 10 claims at a Benchmark hospital from 2011 through 2015. Even with doctors that work at both hospitals, Carolinas had a heart failure rate of 20.03 percent, while those same doctors only use heart failure on 13.81 percent of claims while at the benchmark hospitals. The analysis is based on 41 doctors with 10 claims at Carolinas and 10 claims at a benchmark hospital. In total these doctors had 1,188 claims at Carolinas and 1,101 claims at benchmark hospitals.



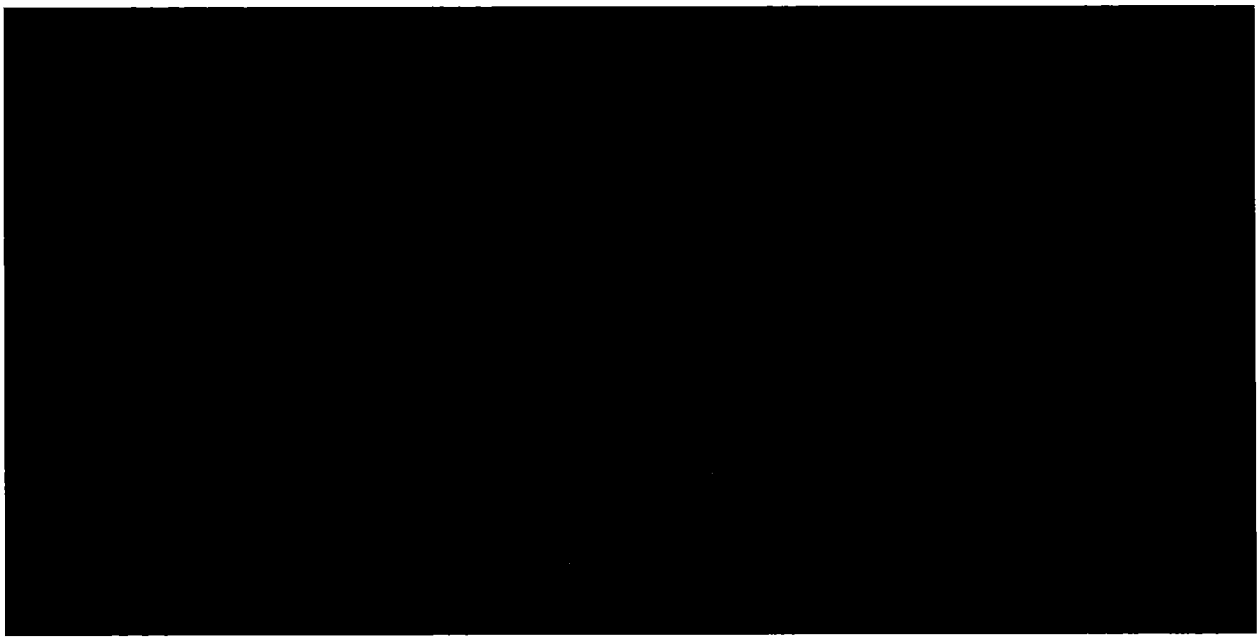
79. Panel A of Figure 19 shows that 115 out of 153 doctors considered (or 75 percent) had a higher usage rate of the Misstated MCCs at Carolinas than at the benchmark hospitals. This suggests the behavior is not limited to a few doctors, but is systemic. Additionally, Panel B shows a density distribution of the rate of Misstated MCC usage for doctors at Carolinas relative to the benchmark. This distribution is shifted to the right, suggesting the upcoding that occurs at Carolinas is extensive.



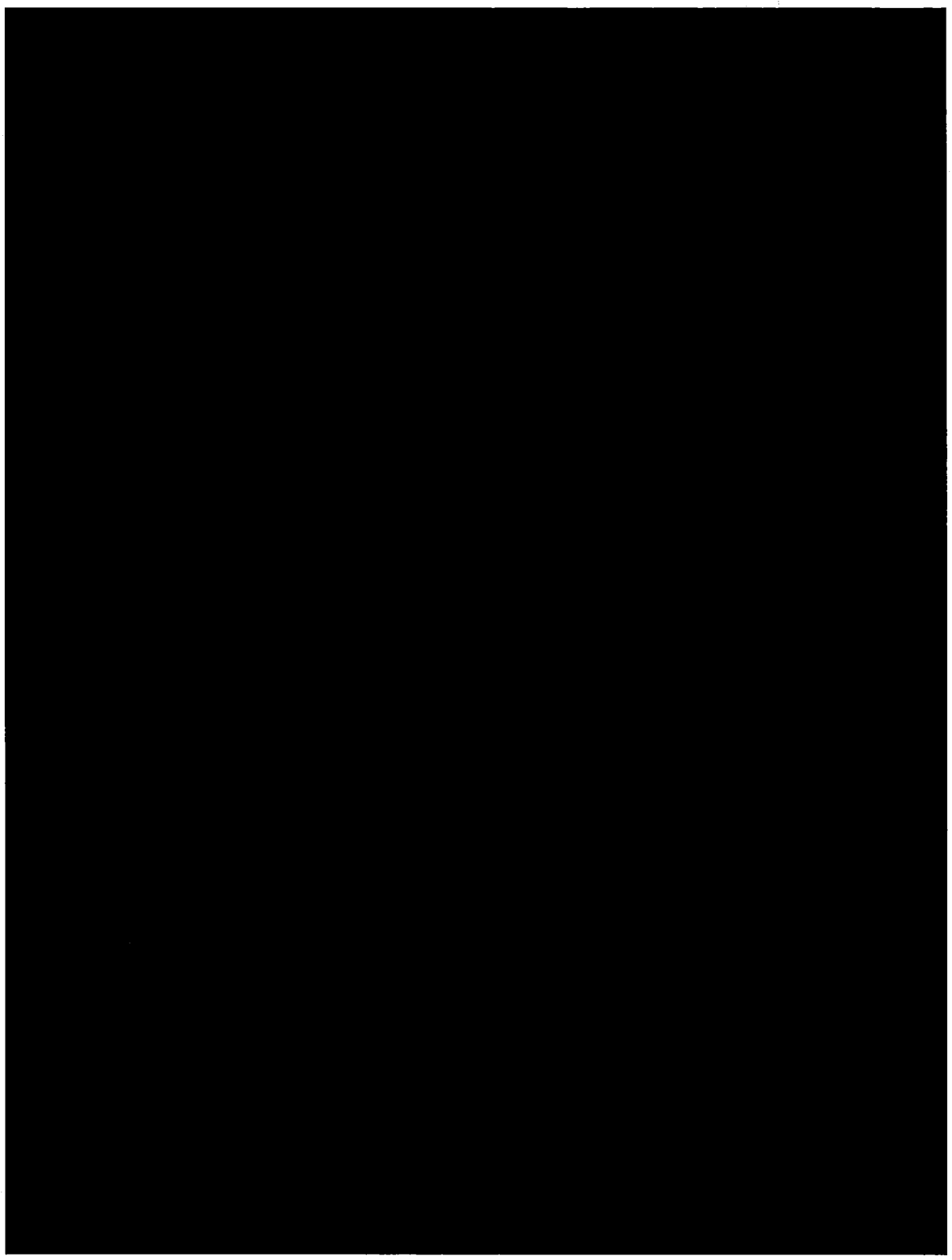
80. Figure 20 shows that a significant number of doctors had higher rates of encephalopathy when they worked at Carolinas than at benchmark hospitals. For example, Panel A shows that 94 doctors out of 126 doctors considered (or 75 percent) used a higher rate at Carolinas.



81. Figure 21 shows that a significant number of doctors had higher rates of respiratory failure when they worked at Carolinas than at benchmark hospitals. For example, Panel A shows that 80 doctors out of 114 doctors considered (or 70 percent) used a higher rate at Carolinas.



82. Figure 22 shows that a significant number of doctors had higher rates of heart failure when they worked at Carolinas than at benchmark hospitals. For example, Panel A shows that 27 doctors out of 41 doctors considered (or 66 percent) used a higher rate at Carolinas.



83. Table 11 below lists the 10 doctors with the largest disparity in upcoding when they worked at Carolinas compared to when they worked at benchmark hospitals. Each of these doctors coded encephalopathy at a rate at least two times higher when at Carolinas.

84. Relator also re-ran the regression analysis for the subset of claims that have at least 10 claims by a doctor at Carolinas and a benchmark hospital.[32] Relator used the same controls from the regression described in section B above, along with a control for the doctor that treated the patient. As shown in Table 12, Carolinas' rate of any MCC, after these controls, was 172 percent of the benchmark rate, and Carolinas' encephalopathy rate was 210 percent of the benchmark rate.

[32] Approximately 40,000 claims were included in this regression.

Table 12. Fixed Effect Regression Controlling for Doctor
Relator used a linear regression to analyze approximately 40 thousand claims with common doctors at Carolinas and benchmark hospitals. The results are presented in the following table. The coefficient is listed first and the p-value is in parenthesis, which represents the statistical significance of the coefficient. A lower p-value means the result is more statistically significant. Coefficients were not included for categorical variables.

	Any of the 3 Major Complications	Enceph-alopathy	Respiratory Failure	Heart Failure
Poverty Rate	-0.0002 (0.8389)	0.0003 (0.7704)	-0.0013 (0.4785)	-0.0027 (0.5913)
Unemployment Rate	-0.0002 (0.9483)	-0.0037 (0.1522)	0.0055 (0.2056)	0.0040 (0.6966)
Log (Median Income)	-0.0276 (0.3750)	0.0367 (0.1999)	-0.0892 (0.0620)	-0.1595 (0.1935)
No HS rate	-0.0014 (0.1055)	-0.0005 (0.5684)	-0.0019 (0.1719)	-0.0066 (0.0951)
Log (los)	0.1121 (<0.0001)	0.0516 (<0.0001)	0.1333 (<0.0001)	0.1332 (<0.0001)
Intercept	0.1327 (0.7169)	-0.4227 (0.2102)	0.8547 (0.1284)	1.8161 (0.2045)
Season Control Variables	Yes	Yes	Yes	Yes
Age Control Variables	Yes	Yes	Yes	Yes
Sex Control Variables	Yes	Yes	Yes	Yes
Race Control Variables	Yes	Yes	Yes	Yes
Discharge Status Group Controls	Yes	Yes	Yes	Yes
Principal Diagnosis Category Controls	Yes	Yes	Yes	Yes
RUCC Control	Yes	Yes	Yes	Yes
Doctor Control Variables	Yes	Yes	Yes	Yes

Carolinas Dummy Variable	0.0778 (<0.0001)	0.0542 (<0.0001)	0.0705 (<0.0001)	0.0673 (<0.0001)
Benchmark Average	14.55%	6.27%	17.36%	13.81%
Carolinas Rate	**22.33%**	**11.69%**	**24.41%**	**20.54%**
Carolinas Relative Effect	**153.47%**	**186.44%**	**140.61%**	**148.73%**

85. This analysis shows that the fraudulent upcoding was not caused by tendencies of certain doctors, but was caused by coding practices that were implemented specifically at Carolinas.

D. Patient Specific Analysis

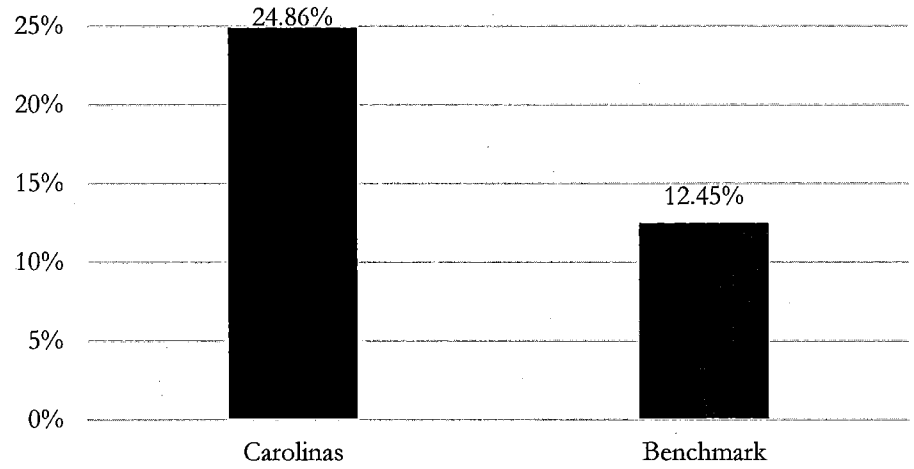
86. The Relator also analyzed patients that attended both Carolinas and a benchmark hospital between 2011 and 2015, and then compared the rate of the MCC codes used when these patients were treated at Carolinas versus when treated at benchmark hospitals.[33]

87. As shown in Figure 23, when only analyzing patients that have at least five claims at Carolinas and five claims at a benchmark hospital, those patients were approximately twice as likely to have one of the Misstated MCCs when they went to Carolinas (24.86 percent of claims) than when they went to a benchmark hospital (12.45 percent of claims). When analyzing patients that had at least one claim at each, the patients had a Misstated MCC on 41.46 percent of claims at Carolinas and on only 25.97 percent of claims at benchmark hospitals.[34]

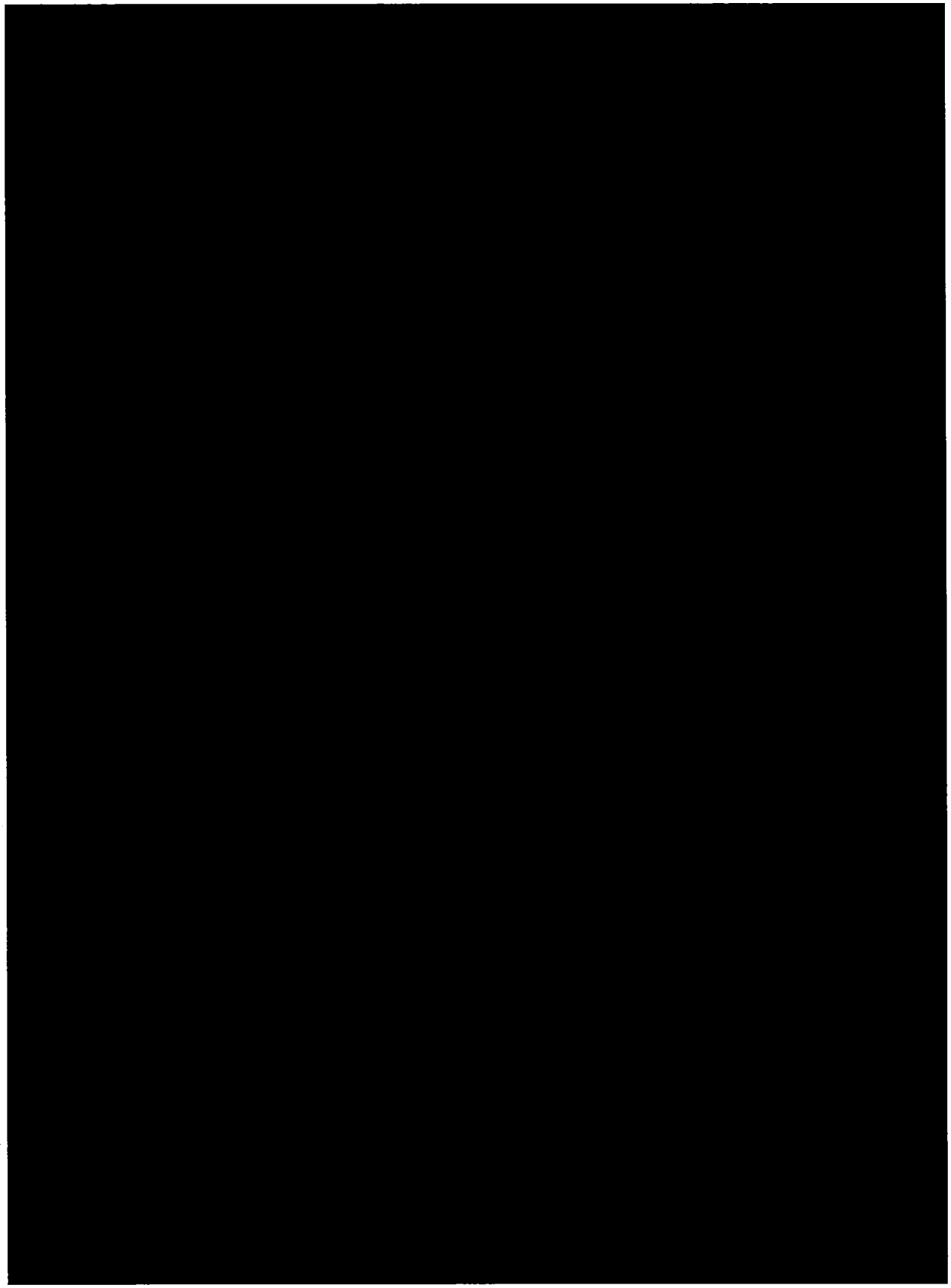
[33] In this analysis, Relator considered all common patients with at least one relevant MCC code in the relevant claims. Patients without an MCC at Carolinas or the Benchmark were excluded from this analysis. Including these patients would have almost no impact on the ratios for each of these disease categories.

[34] This is based on analysis of 9,422 claims at Carolinas and 10,968 claims at the benchmark hospitals.

Figure 23. Rate of Any Misstated MCC at Carolinas Relative to Benchmark for Claims with Common Patients.
This figure compares the percentage of claims that include any Misstated MCC at Carolinas versus the benchmark, for the claims involving common patients at both hospitals from 2011 through 2015. Even with patients that visited both hospitals, the patients have Misstated MCCs on 24.86% of their claims at Carolinas, and only on 12.45% of their claims at benchmark hospitals. There were a total of 64 patients with at least five claims at Carolinas and five claims at a benchmark hospital, having a total of 543 claims at Carolinas and 506 claims at benchmark hospitals.



88. There were 64 patients with at least five claims at both Carolinas and a benchmark hospital. As shown in Figure 24, Panel A, 42 of these patients (or 66 percent) were coded with a Misstated MCC more frequently when they visited Carolinas than when they visited benchmark hospitals. This includes one patient with a Misstated MCC on more than 75% of his/her claims at Carolinas, while having zero Misstated MCCs at the benchmark. Panel B provides a distribution of the patients, which is significantly skewed to the right, suggesting that the same patients had significantly higher levels of upcoding at Carolinas than at benchmark systems.



89. As this analysis shows, even when looking at the same patient, Carolinas has significantly higher rates of Misstated MCCs than benchmark hospitals. This shows that the upcoding behavior cannot be attributable to patient differences, but is instead unique to coding practices in place at Carolinas.

E. Geographic Analysis

90. Relator also excluded the possibility that the higher rate of Misstated MCCs at Carolinas is due to regional differences in the patient population by comparing the rate of Misstated MCCs between Carolinas and the benchmark hospitals in North Carolina.

91. As shown in Table 13, Carolinas had a significantly higher rate of Misstated MCCs in each region, with a region showing a rate more than twice as high at Carolinas. As shown in Table 14, Table 15, and Table 16, Carolinas had a higher rate of encephalopathy, respiratory failure, and heart failure than the benchmark hospitals in North Carolina, both in metropolitan areas and non-metropolitan areas.

Table 13. Misstated MCC Rate by State and MSA
This table compares the rate of Misstated MCCs in the suspicious patterns for the hospitals in Carolinas and the Benchmark within the same geographic region.

Region	Carolinas MCC Rate	Benchmark MCC Rate	Carolinas Rate Relative to Benchmark	P-Value
Non-Metro areas in North Carolina	24.59%	11.20%	220%	<0.00001
Metro areas in North Carolina	21.96%	15.68%	140%	<0.00001

Table 14. Encephalopathy Rate by State and MSA
This table compares the encephalopathy rate of the suspicious patterns for the hospitals in Carolinas and the Benchmark within the same geographic region.

Region	Carolinas MCC Rate	Benchmark MCC Rate	Carolinas Rate Relative to Benchmark	P-Value
Non-Metro areas in North Carolina	12.41%	4.10%	303%	<0.00001
Metro areas in North Carolina	13.47%	8.72%	155%	<0.00001

Table 15. Respiratory Failure Rate by State and MSA
This table compares the respiratory failure rate of the suspicious patterns for the hospitals in Carolinas and the Benchmark within the same geographic region.

Region	Carolinas MCC Rate	Benchmark MCC Rate	Carolinas Rate Relative to Benchmark	P-Value
Non-Metro areas in North Carolina	27.23%	13.30%	205%	<0.00001
Metro areas in North Carolina	23.26%	16.60%	140%	<0.00001

Table 16. Heart Failure Rate by State and MSA
This table compares the heart failure rate of the suspicious patterns for the hospitals in Carolinas and the Benchmark within the same geographic region.

Region	Carolinas MCC Rate	Benchmark MCC Rate	Carolinas Rate Relative to Benchmark	P-Value
Non-Metro areas in North Carolina	18.35%	14.54%	126%	<0.00001
Metro areas in North Carolina	20.04%	13.48%	149%	<0.00001

92. Based on this geographic concentration analysis, Relator has shown that the fraudulent upcoding cannot be attributed to geographic factors unique to Carolinas, but is likely caused by coding practices in place at Carolinas.

3. Economic Damages

93. Relator has limited this complaint to only the most extreme cases—*i.e.*, where Carolinas used a Misstated MCC code at two times the rate of comparable hospitals or at least three percentage points of its entire patient population higher than benchmark hospitals. Additionally, only results that were statistically significant at a 99.9% rate—or almost certainly not random—were considered fraudulent. The following describes Relator's methodology for aggregating the total dollar value of the fraud committed by Carolinas.

94. For each pattern, Relator calculated the number of fraudulent claims by comparing Carolinas' Misstated MCC rate to the rate at the comparable benchmark of hospitals. Any uses of a secondary Misstated MCC in excess of the rate at comparable hospitals was flagged as

fraudulent. For example, the average use of encephalopathy on Influenza claims (ICD-9 diagnosis codes beginning with 487) at benchmark hospitals is 4.9%, and Carolinas uses it on 52 of 487 claims (10.68%). Relator's calculation assumes that Carolinas should only have used encephalopathy on 24 claims, representing 4.9% of its 487 total Influenza claims. Therefore, Carolinas fraudulently upcoded 28 (52 minus 24) Influenza claims by adding encephalopathy.

95. To determine the dollar value of the fraud, Relator calculated the difference in the average value of DRGs with Misstated MCCs versus the value of DRGs without Misstated MCCs, weighted based on Carolinas' distribution of DRGs that are used in the claims for that principal diagnosis code. This gave Relator a per-claim value of adding a Misstated MCC, which it then multiplied by the number of fraudulent claims to determine the total amount of additional revenue Carolinas gained on a given principal diagnosis code by fraudulently adding a Misstated MCC secondary code. Additionally, Relator took care to not double count the value of any losses due to fraud by only counting a claim as fraudulent once, even if it included two Misstated MCCs that were both determined to be fraudulently upcoded.

96. Relator then multiplied each upcoded claim by the additional revenue for the Misstated MCC. The following table lists the total dollar value of the fraud by each Misstated MCC secondary code used by Carolinas. Each pattern excludes fraud damages that are already included in the complication category above it. For example, any principal diagnosis patterns that were upcoded with encephalopathy and respiratory failure are included only in the damages for encephalopathy.

Secondary MCC	Dollar Value of Fraud
Encephalopathy	$24,721,901
Respiratory Failure	$31,263,189
Heart Failure	$5,696,739
Total	$61,681,829

97. Each of these calculations are conservative. For example, Relator only included instances where Carolinas used the Misstated MCC code at two times the rate of comparable hospitals or were at least three percentage points of the entire patient population higher. A lower threshold could have been used and would result in higher damages. Additionally, Relator only considered claim groupings where there was less than a one-in-a-thousand chance that the difference in major complication rate at Carolinas versus the benchmark was due to random causes.

98. Additionally, Relator re-ran its fixed effect linear regression model but changed the dependent variable to represent the additional revenue due to upcoding. For each claim, Relator calculated the difference in the DRG weight between claims with Misstated MCCs and claims without Misstated MCCs.[35] Relator then conservatively multiplied this difference in weight by an estimated base rate of $5,000.[36] Based on this regression, Relator's analysis shows that Carolinas receives an additional $64.2 million in false claims due to fraudulent MCC upcoding, after controlling for a number of patient demographic and other health factors. This represents the marginal revenue that can be directly attributed to the actions of Carolinas, while controlling for possible differences in patient, regional, and claim characteristics (including principal diagnosis code, discharge status, and length of stay).

99. Lastly, Relator considered the financial impact of comparing Carolinas' claims to the universe of hospitals instead of just the benchmark of less fraudulent hospitals. Comparing to

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[35] For claims that could have been a complication or without complication, the Relator took a weighted average of DRG weights for these two DRGs. This was weighted by Carolinas' historical distribution of DRG severity levels. Approximately 20.8% of claims were assumed to be without complication and 79.2% were assumed to be with complication. If Carolinas also upcodes using complications, the number would be even more conservative.

[36] The base rate from 2011 through 2015 varies from $5,164 to $5,438. This base rate is multiplied by the DRG weight and then adjusted for hospital specific factors, such as cost of living adjustments and disproportionate share payments.

the universe is excessively conservative as the universe includes a number of hospitals that are known to have engaged in fraudulent billing practices, as determined by a review of settlement agreements with the US Department of Justice, along with other entities. Nonetheless, comparing to the entire universe of short term acute care hospitals would lead to an estimated $47.0 million in false claims at Carolinas.

100. Relator's consideration of other possible explanations, such as claim characteristics, patient characteristics, doctor practices, and regional effects, strongly suggests the coding practices were intentionally implemented across the system. Additionally, the statistical significance of the analysis finds a nearly impossible probability that the practices are due to random factors. Thus, Relator's damage model estimate of $61.7 million in Carolinas upcoding is robust when controlling for a variety of factors, and there is an extremely high degree of confidence that the economic damages sought are the result of Carolinas' fraud.

V. CAUSES OF ACTION

COUNT ONE
Violation of the Federal False Claims Act, 31 U.S.C. § 3729(a)
(Against All Defendants)

101. Relator repeats and realleges each and every allegation contained above as if fully set forth herein.

102. As described above, Defendants have submitted and/or caused to be submitted false or fraudulent claims to Medicare by falsifying information concerning patient diagnoses, complications, and comorbidities; and by failing to report and return overpayments from Medicare within the required time period.

103. Defendants, by the conduct set forth herein, have violated:

a. 31 U.S.C. § 3729(a)(1)(A) by knowingly presenting, or causing to be presented, false or fraudulent claims for payment or approval; and/or

b. 31 U.S.C. § 3729(a)(1)(B) by knowingly making, using or causing to be made or used, a false record or statement material to a false or fraudulent claim; and/or

c. 31 U.S.C. § 3729(a)(1)(G) by knowingly making, using, or causing to be made or used, a false record or statement material to an obligation to pay or transit money or property to the government, or knowingly concealing or knowingly and improperly avoiding or decreasing an obligation to pay or transmit money or property to the government.

104. The United States has suffered and continues to suffer damages as a direct proximate result of Defendants' false or fraudulent claims.

PRAYER FOR RELIEF

WHEREFORE, Relator prays for relief and judgment, as follows:

(a) Defendants pay an amount equal to three times the amount of damages the United States has suffered because of Defendants' actions, plus a civil penalty against Defendants of not less than $5,500 and not more than $11,000 for each violation of 31 U.S.C. § 3729;

(b) Relator be awarded the maximum amount allowed pursuant to 31 U.S.C. § 3729(d);

(c) Relator be awarded all costs of this action, including attorneys' fees, expenses, and costs pursuant to 31 U.S.C. § 3730(d); and

(d) Relator and the United States be granted all such other relief as the Court deems just and proper.

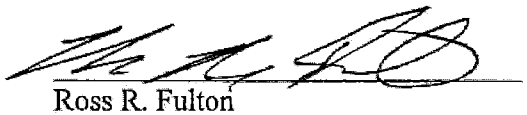
VI. JURY TRIAL DEMANDED

Relator hereby demands a trial by jury.

DATED: September 18, 2017

Respectfully submitted,

RAYBURN COOPER & DURHAM, P.A.



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