GENDER PAY GAP AMONG PHYSICIANS:
EXAMINING DIFFERENCES IN BILLED CHARGES
BETWEEN MALE AND FEMALE PHYSICIANS

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A dissertation submitted in partial fulfillment of
the requirements for the degree of
Doctor of Health Administration

School of Health Sciences

Central Michigan University
Mount Pleasant, Michigan
September 2017

Life is not primarily a quest for pleasure, as Freud believed, or a quest for power, as Alfred Adler taught, but a quest for meaning. The greatest task for any person is to find meaning in his or her own life.

Viktor E. Frankl

This dissertation is dedicated to my amazing best buddy and true love,
Terrence Wearsch.
He supported me tirelessly throughout this pursuit.
I could not have achieved this without him.

ACKNOWLEDGEMENTS

ABSTRACT

GENDER PAY GAP AMONG PHYSICIANS:
EXAMINING DIFFERENCES IN BILLED CHARGES
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by Julie Marie Doherty

There are many known and presumed causes for the gender wage gap within the healthcare sector in the United States. One overlooked potential cause is the individual physician's fee schedule. To date, there have been no studies examining the relationship between physician gender and billed charges as they appear on the physician's fee schedule.

The purpose of this study was to determine if there is a difference in average billed charges by gender. In other words, the study examined if male and female private practice physicians charge the same for their services, or if there is a difference in billing behavior between the two sexes.

By examining Healthcare Common Procedure Coding System (HCPCS) codes 99212, 99213, and 99214 for private practice physicians, this quantitative, cross sectional research study aimed to identify differences in:

1. Average Submitted Charge Amounts, by gender

2. Number of Services, by gender

3. Distribution of office visit level, by gender

4. Average Submitted Charge Amounts compared to Number of Services, by gender

For the purpose of the study, the Medicare Provider Utilization and Payment Data: Physician and Other Supplier Public Use File for calendar year 2015 (Medicare Provider Utilization and Payment Data: Physician and Other Supplier Public Use File Data CY 2015, 2017) was used. The data includes variables such as: Gender of the Provider, Entity Type of the Provider, HCPCS codes, Number of Services, Number of Medicare Beneficiaries, Average Medicare Allowed Amount, and Average Submitted Charge Amount for male and female physicians for calendar year 2015, the most recent available data.

This study demonstrated a difference in Average Submitted Charge Amounts between male and female physicians: female physicians, on average, had higher submitted charge amounts than male physicians.

The study also examined the relationship between Number of Services and gender, as well as Average Submitted Charge Amounts and Number of Services. The study results indicate that female physicians have a significantly lower Number of Services than the males and a significantly lower Number of Medicare Beneficiaries than male physicians.

Distribution of the selected Evaluation and Management codes was also examined. As a proportion of the total volume of codes 99212, 99213, and 99214, female physicians billed a larger portion of codes 99213 and 99214 than the males. Finally, analysis showed Number of Services had a negative effect on Average Submitted Charge Amounts. On average, lower case volume correlated with higher submitted charges.

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KEY TO ACRONYMS

AMA   American Medical Association

CMS   Centers for Medicare & Medicaid Services

DMEPOS   Durable Medical Equipment, Prosthetics, Orthotics and other
               Supplies

FOIA   Freedom of Information Act

GPCI   Geographic Practice Cost Index

HCPCS   Healthcare Common Procedure Coding System

NPPES   National Plan and Provider Enumeration System

NPI   National Provider Identifier

PUF   Public Use File

DEFINITION OF TERMS

Average Medicare Allowed Amount: Average of the Medicare allowed amount for the service; this figure is the sum of the amount Medicare pays, the deductible and coinsurance amounts that the beneficiary is responsible for paying, and any amounts that a third party is responsible for paying.

Average Medicare Payment Amount: Average amount that Medicare paid after deductible and coinsurance amounts have been deducted for the line item service.

Average Medicare Standardized Amount: Average amount that Medicare paid after beneficiary deductible and coinsurance amounts have been deducted for the line item service and after standardization of the Medicare payment has been applied.

Average Submitted Charge Amount: Average of the charges that the provider submitted for the service.

Credentials of the Provider: When the provider is registered in NPPES as an individual (entity type code='I'), these are the provider's credentials. When the provider is registered as an organization (entity type code = 'O'), this will be blank.

Medicare Participation Indicator: Identifies whether the provider participates in Medicare and/or accepts assignment of Medicare allowed amounts.

Number of Distinct Medicare Beneficiary/Per Day Services: Number of distinct Medicare beneficiary/per day services. Since a given beneficiary may receive multiple services of the same type (e.g., single vs. multiple cardiac stents) on a single day, this metric removes double counting from the line service count to identify whether a unique service occurred.

Number of Medicare Beneficiaries: Number of distinct Medicare beneficiaries receiving the service.

Place of Service Indicator: Identifies whether the place of service submitted on the claims is a facility (value of 'F') or non-facility (value of 'O').

CHAPTER I

INTRODUCTION

Background

Gender wage inequality in the United States is a troubling labor topic appearing in news headlines regularly. Despite all of the national attention, the issue is showing little improvement. The gender wage gap stretches across every stratum of the work force, and in every industry. The Institute for Women's Policy Research estimated the wage gap between men and women to be approximately 20.4 percent based on 2015 annual earnings (Hegewisch & DuMonthier, 2016), meaning that on average, a woman earns twenty cents less for every dollar that a man earns in the United States. The number is staggering on its own, but consider what that means for annual income, retirement contributions, employer matches, annual bonuses and the effect of lost investment growth opportunity over a career. The long-term consequences are great.

The gender wage gap is a confounding problem that has enlisted social scientists, economists, federal and state agencies, academics, and politicians to identify causes and create solutions to close the gap. According to a recent report by the Joint Economic Committee (Joint Economic Committee, 2016), "economists believe that the gender pay gap is caused by complex factors. However, even when all those factors are taken into account, as much as 40 percent of the pay gap may be attributed to discrimination" (Joint Economic Committee, 2016). It is the twenty first century and men and women with the same qualifications, education and job skills, are being paid differently, perhaps, in part, because of gender discrimination.

Pay inequality continues to pervade most industries, including the medical industry sector. While there is an abundance of data regarding the gender wage gap as a whole, only a small portion of that data reflects the wage gap as it pertains to physicians. An analysis of faculty physician salaries at twenty-four United States medical schools showed "among 10,241 physicians, female physicians (n = 3,549) had lower mean (SD) unadjusted salaries than male physicians ($206,641 [$88,238] vs. $257,957 [$137,202]" (Jena, Olenksi, & Blumenthal, 2016). Interestingly, this finding reinforces the Institute for Women's Policy Research estimate of a twenty percent wage gap across all workers.

Broad studies identify wage gaps between male and female doctors and surmise potential causes. Researchers have postulated factors that could contribute to the gender wage gap among physicians including gender bias and time out of the work force to raise or care for children and/or elderly parents which consequently reduces a female physician's annual and lifetime earnings. Others cite potential contributors to the physician wage gap are geography, specialty, payer mix, and patient population.

Most members of the work force have little say in the wages they earn, aside from trying to negotiate with a new employer, sometimes with minimal effect. For most new employees, the job offer and corresponding pay are non-negotiable. Because most companies encourage their employees to keep their salaries private, it is not uncommon for a team of people working together to be ignorant of each other's pay or how their own salary stacks up in comparison. The fact that most workers have little visibility to colleagues' pay is a benefit to the employer as it reduces salary negotiation leverage.

Knowledge of one's peers' pay is one example of how the medical industry is unique. The Centers for Medicare and Medicaid Services (CMS) is the largest health insurer in the United States, "covering 100 million people" (Covering 100 million people, 2017). CMS publishes annual datasets reporting the physician claims for Medicare beneficiaries from prior years. Data reported includes: number of patient encounters for each provider, Healthcare Common Procedure Coding System (HCPCS) codes, the Medicare allowable charge per HCPCS code, provider gender, provider credentials, provider address and each provider's billed charge per HCPCS code. Physicians and healthcare consumers alike have the ability to look at the fees charged by any physician who treats Medicare beneficiaries. In other words, physicians have visibility to what their peers and competitors are charging. Knowing what a physician charges for each HCPCS code provides a glimpse at what their potential annual earnings might look like.

Another nuance that sets private practice physicians apart from the rest of the labor force is the opportunity to set their own pay rate. Physicians accomplish this by negotiating their rates in contracts with private payers. Many physician-negotiated, private payer contracts stipulate payment as a percentage of billed charges or a multiple of the Medicare allowable. After negotiating a contract with a private payer, the physician's final step is to ensure his fee schedule is set appropriately in order to benefit maximally from the contract. While contracted rates and case carve outs require the cooperation and agreement of the respective health insurer, the fee schedule is entirely up to the private practice physician. Medicare reimburses physicians based on a set, published fee schedule modified by locality to account for variations in wage indices.

The physician fee schedule represents a key component in overall physician reimbursement. Every private practice physician designs a fee schedule to outline his rates, or billed charges, specific for each procedure that he performs. Each procedure maps to a HCPCS number, which is based on the American Medical Association's (AMA) Current Procedural Terminology (CPT®) manual. Since it is up to an individual's discretion, it is possible that male and female private practice physicians charge differently for providing the same services.

In addition to understanding how to set a fiscally responsible fee schedule, physicians are also burdened with the business task of reviewing and resetting their fee schedule a recommended "every three to twelve months" (American Medical News, 2009). Many private practice contracts reflect a negotiated rate based on the current Medicare rates. However, since Medicare adjusts their rates annually, practices must be diligent in updating the charges in their billing software to reflect these changes. Failure to do so could cost a practice thousands to millions of dollars.

Given the lack of clear guidance, it is no wonder that the range of professional fees billed for a given procedure code can be vast. For example, according to the Medicare Provider Utilization and Payment Data: Physician and Other Supplier Public Use File for calendar year 2014, a screening colonoscopy (CPT® 45378) demonstrated a range of provider billed charges from $149.88 to $16,800. An explanation for either of the charges is unapparent. These charges also do not appear to reflect the use of a multiplier or other algorithm of the Medicare allowed rate. The charges look to be random; two wildly different fees for the same procedure.

Purpose of the Study

The purpose of this study was to look at differences in Average Submitted Charge Amounts between male and female physicians to determine if there are variances in average charges by gender. In other words, the study examined if male and female physicians charge the same for their services, or if there is a difference in billing behavior between the two sexes. Although there are a variety of contributing factors that potentially may explain the gender wage gap among physicians, one possible factor is the individual provider's fee schedule.

Additionally, this study determined if there is a relationship between physician gender and Number of Services (case volume), as well as if there is a relationship between Average Submitted Charge Amounts and Number of Services. If male physicians see more patients than female physicians, the study could show a possible contributor to the physician wage gap. By looking at Average Submitted Charge Amounts and Number of Services, the study determined that physicians with higher case volumes charge less for their services than providers with lower case volumes. Lastly, the study sought to determine if female physicians tend to report lower level office visit codes more frequently compared to males, as a proportion of their office visit volume.

CHAPTER II

METHODS

Study Design and Population

This quantitative, cross sectional research study aimed to identify differences in:

1. Average Submitted Charge Amounts, by gender for HCPCS codes 99212, 99213, and 99214 for private practice physicians

2. Number of Services by gender for HCPCS codes 99212, 99213, and 99214 for private practice physicians

3. Distribution of office visit level, by gender for HCPCS codes 99212, 99213, and 99214 for private practice physicians

4. Average Submitted Charge Amounts compared to Number of Services, by gender for HCPCS codes 99212, 99213, and 99214 for private practice physicians.

By reviewing a public data set, the Medicare Provider Utilization and Payment Data: Physician and Other Supplier Public Use File for calendar year 2015 (Medicare Provider Utilization and Payment Data: Physician and Other Supplier Public Use File Data CY 2015, 2017) the study examined data for male and female physicians meeting the following criteria:

Provider Specialty: All

Provider Credentials: Medical Doctor or Doctor of Osteopathy

Provider Gender: Male or Female

Provider Geography: Practice must be located in the United States

Site of Service: Office Location

Procedures Performed: 99212, 99213, and 99214

Provider Patient Population: Must treat Medicare beneficiaries enrolled in the fee-
for-service program

To be included in the dataset, the physicians must have had a valid

National Provider Identifier (NPI) number and the provider must have submitted

Medicare Part B non-institutional claims (excluding DMEPOS) during the 2015 calendar

year.

Data Source

This study used the public data set, Medicare Provider Utilization and

Payment Data: Physician and Other Supplier Public Use File for calendar year 2015

(Medicare Provider Utilization and Payment Data: Physician and Other Supplier Public

Use File Data CY 2015, 2017).

According to the Centers for Medicare & Medicaid Services (CMS) (2017):

The data for the Physician and Other Supplier PUF are based upon CMS

administrative claims data for Medicare beneficiaries enrolled in the fee-

for-service program. Beginning with CY2014, data are available from the

CMS Chronic Condition Data Warehouse (CCW), a database with 100%

of Medicare enrollment and fee-for-service claims data. For all Physician

and Other Supplier PUF data years, provider demographics (name,

credentials, gender, complete address and entity type) are included from

the National Plan & Provider Enumeration System (NPPES). CMS

developed the NPPES to assign unique identifiers, known as National

Provider Identifiers (NPIs), to health care providers. The health care

provider's demographic information is collected at the time of enrollment

and updated periodically. The demographics information provided in the

2014 Physician and Other Supplier PUF was extracted from NPPES at the

end of calendar year 2015.

Regarding physician privacy, the Centers for Medicare & Medicaid Services

(2017) state:

Prior to deciding to release physician payment information, as required by

the FOIA and case law interpreting FOIA Exemption 6, CMS weighed the

privacy interests of physicians and the public's interest in shedding light on

Government activities and operations and has determined that the public's

interest outweighs the privacy interests.

Statistical Analyses

Descriptive and inferential statistical methods were used to analyze the data to

answer the research questions. Data on categorical variables like gender, participation

in Medicare, and HCPCS code are presented using frequency distributions. Data on

quantitative variables are summarized using measures of mean and standard deviation.

Association between categorical variables like gender, participation in Medicare and

HCPCS code were tested using the Chi square test for independence of attributes.

Tests for significance of difference between quantitative variables like Average

Submitted Charge Amount and Number of Services were performed using independent

samples t test. A multiple linear regression analysis was performed to evaluate the

effect of both categorical and quantitative predictor variables using Average Submitted Charge Amount and Number of Services as dependent variables.

Outliers and influential observations are known to influence multiple regression analyses. Outliers were detected by studentized residual values. Given the large size of the sample, a cut off value of 1.96 was used to include normal observations as a part of regression analysis. Any observation having a studentized residual value of more than 1.96 was excluded and the regression model was fitted again. The Breusch-Pagan test was used to test for heteroscedasticity in the regression model. Regression model assumes constant error variance or homoscedasticity in the model. Violation of this assumption leads to the problem of heteroscedasticity, which effectively leads to inefficient model parameter estimates. In the Breusch-Pagan test, the null hypothesis Ho: No heteroscedasticity was tested against the alternate hypothesis H1: There is heteroscedasticity. If the results of the Breusch-Pagan test failed homoscedasticity assumption, then the regression model was fitted again using robust standard error measures for heteroscedastic version. Regression model further assumes that random error term is independently distributed or they are not correlated. This assumption of no auto or serial correlation is tested using the Durbin-Watson test where null hypothesis Ho: No autocorrelation is tested against the alternative hypothesis H1: Auto correlation. Multiple regression model also assumes that there is no severe multicollinearity in the model. Multicollinearity is the problem of highly correlated predictor variables in the regression model. Highly correlated predictor variables lead to inflated standard errors of model parameter estimators. Severity of multicollinearity was assessed using

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measure of variance inflation factor (VIF). A large value of VIF indicates severe

multicollinearity. Generally, an upper limit of VIF = 5.0 is taken for acceptable value for

no severe multicollinearity (Hair, Black, Bain & Anderson, 2010). All statistical tests

were performed at a .05 level of significance. Statistical analyses were performed using

STATA software application version 15.0.

CHAPTER III

RESULTS

Table 1 reports descriptive statistics of the study variables. Categorical variables are summarized using frequency and relative frequency. Quantitative variables are summarized using mean and standard deviation.

Table 1. Descriptive Statistics for Study Variables

		n	%	Mean	SD
Gender	Male	458101	73.83		
	Female	162347	26.17		
Medicare Participation	Yes	620045	99.94		
	No	403	0.06		
HCPCS Code	99212	91069	14.68		
	99213	273764	44.12		
	99214	255615	41.20		
Number of Services				190.389	214.713
Number of Medicare Beneficiaries				130.908	143.363
Number of Distinct Medicare Beneficiaries				190.379	214.703
Average Medicare Allowed Amount				83.265	23.968
Average Submitted Charge Amount				152.036	69.647
Average Medicare Payment Amount				57.798	17.786
Average Medicare Standardized Amount				59.082	17.331

Table 2 reports descriptive statistics of the study variables classified by gender.

Table 2. Descriptive Statistics for Study Variables by Gender

	Gender		n	%	Mean	SD
Medicare Participation	Male	Yes	457854	99.95		
		No	247	0.05		
	Female	Yes	162191	99.9		
		No	156	0.1		
HCPCS Code	Male	99212	71770	15.67		
		99213	200496	43.77		
		99214	185835	40.57		
	Female	99212	19299	11.89		
		99213	73268	45.13		
		99214	69780	42.98		
Number of Services	Male				199.497	223.068
	Female				164.686	186.779
Number of Medicare Beneficiaries	Male				140.892	151.471
	Female				102.738	112.837
Number of Distinct Medicare Beneficiaries	Male				199.486	223.057
	Female				164.679	186.771
Average Medicare Allowed Amount	Male				82.545	24.121
	Female				85.297	23.410
Average Submitted Charge Amount	Male				149.955	69.493
	Female				157.908	69.746
Average Medicare Payment Amount	Male				57.439	17.888
	Female				58.808	17.456
Average Medicare Standardized Amount	Male				58.888	17.494
	Female				59.628	16.849

Table 3 reports cross table of categorical variables of Medicare participation and HCPCS Code with gender. For male physicians, 99.95% of transactions reported Medicare participation while the same percentage for females was 99.9. Though small, the difference in percentage of providers identified as participating in Medicare was

found to be statistically significant (χ^2 (1) = 32.843, p = <.001). Similarly, significant

association was reported between HCPCS code and gender (χ^2 (2) = 1400, p = <.001).

Table 3. Descriptive Statistics for Categorical Variables by Gender and Test for
Association

	Gender		n	%	χ^2	p	Cramer's V
Medicare	Male	Yes	457854	99.95	32.843	<.001	.007
Participation		No	247	0.05			
	Female	Yes	162191	99.9			
		No	156	0.1			
HCPCS Code	Male	99212	71770	15.67	1400	<.001	.047
		99213	200496	43.77			
		99214	185835	40.57			
	Female	99212	19299	11.89			
		99213	73268	45.13			
		99214	69780	42.98			

Table 4 reports descriptive statistics of interval scale or continuous variables

across gender and the associated independent samples t test results. Male physicians

reported mean Number of Services M = 199.497 (SD = 223.067) while females reported

mean M = 164.686 (SD = 186.779). Results of independent samples t test indicates

that null hypothesis of no significant difference in mean number of services must be

rejected at .05 level of significance (Difference in mean = 34.811, p = <.001). Precisely,

male physicians had significantly higher mean Number of Services provided compared

to female physicians.

Male physicians reported mean Number of Medicare Beneficiaries M = 140.892

(SD = 151.471) while females reported mean M = 102.738 (SD = 112.837). Results of

independent samples t test indicates that null hypothesis of no significant difference in

mean number of Medicare beneficiaries must be rejected at .05 level of significance (Difference in mean = 38.154, p = <.001). Precisely, male physicians reported significantly higher mean Number of Medicare Beneficiaries compared to females.

Male physicians reported mean Number of Distinct Medicare Beneficiary/Per Day services M = 199.486 (SD = 223.057) while females reported mean M = 164.679 (SD = 186.771). Results of independent samples t test indicates that null hypothesis of no significant difference in mean number of distinct Medicare beneficiaries must be rejected at .05 level of significance (Difference in mean = 34.807, p = <.001). Precisely, male physicians reported significantly higher mean Number of Distinct Medicare Beneficiary/Per Day services compared to females.

Male physicians reported mean Average Medicare Allowed Amount as M = 82.545 (SD = 24.121) while females reported mean M = 85.297 (SD = 23.410). Results of independent samples t test indicates that null hypothesis of no significant difference in Average Medicare Allowed Amount must be rejected at .05 level of significance (Difference in mean = 2.752, p = <.001). Precisely, females report significantly higher Average Medicare Allowed Amount (by $2.752) compared to males.

Male physicians reported mean Average Submitted Charge Amount as M = 149.955 (SD = 69.493) while females reported mean M = 157.908 (SD = 69.746). Results of independent samples t test indicates that null hypothesis of no significant difference in mean average amount charged must be rejected at .05 level of significance (Difference in mean = 7.953, p = <.001). Precisely, the Average Submitted Charge Amount is significantly higher for female physicians compared to male physicians.

Male physicians reported mean Average Medicare Payment Amount as M = 57.439 (SD = 17.888) while females reported mean M = 58.808 (SD = 17.456). Results of independent samples t test indicates that null hypothesis of no significant difference in mean Average Medicare Payment Amount must be rejected at .05 level of significance (Difference in mean = $1.369, p = <.001). Precisely, the Average Medicare Payment Amount is significantly higher for female physicians compared to male physicians.

Male physicians reported mean Average Medicare Standardized Amount as M = 58.888 (SD = 17.494) while females reported mean M = 59.628 (SD = 16.849). Results of independent samples t test indicated that null hypothesis of no significant difference in mean Average Medicare Standardized Amount must be rejected at .05 level of significance (Difference in mean = $0.740, p = <.001). Precisely, the Average Medicare Standardized Amount is significantly higher for females compared to males.

Table 4. Descriptive Statistics for Continuous Variables by Gender and Test for Association

	Gender	Mean	SD	T	p
Number of Services	Male	199.497	223.068	61.204	<.001
	Female	164.686	186.779		
Number of Medicare Beneficiaries	Male	140.892	151.471	110	<.001
	Female	102.738	112.837		
Number of Distinct Medicare Beneficiaries	Male	199.486	223.057	61.2003	<.001
	Female	164.679	186.771		
Average Medicare Allowed Amount	Male	82.545	24.121	40.368	<.001
	Female	85.297	23.410		
Average Submitted Charge Amount	Male	149.955	69.493	39.509	<.001
	Female	157.908	69.746		
Average Medicare Payment Amount	Male	57.439	17.888	26.975	<.001
	Female	58.808	17.456		
Average Medicare Standardized Amount	Male	58.888	17.494	15.051	<.001
	Female	59.628	16.849		

Table 5 reports estimates of model parameters of regression model with Average Submitted Charge Amount as the dependent variable with gender and HCPCS code taken as predictor variables. Number of Services provided, whether participating in Medicare or not, Number of Medicare Beneficiaries, and Average Medicare Standardized Amount are taken as control variables. Fitted model reported a large number of outliers. To detect outliers, studentized residuals were used. Regression model was rerun excluding observations reporting absolute studentized residual of more than 1.96. The revised fitted regression model is reported in Table 5.

However, the Breusch-Pagan test for heteroscedasticity in the model reported p value p = <.001 (χ^2 (1) = 35235.35, p = <.001) indicating heteroscedasticity or non-constant error variance problem in the model. To account for this problem, robust standard error measures were used and regression model was fitted again. Table 6 shows the results of the regression model with the use of robust standard errors. Fitted model reports R squared = 0.4153 indicating that predictor variables together account for 41.53% of the total variance in the average amount charged. Also, ANOVA test results indicate that null hypothesis of no significant overall model must be rejected at .05 level of significance (F (7, 593614) = 75415.44, p = <.001). This indicates that the overall model is statistically significant.

Table 5. Regression Model Parameter Estimates and Test for Their Significance with Average Submitted Charge Amount as Dependent Variable

		β	SE (β)	t	p	95% CI for β
Gender	Female	4.418	.127	34.74	<.001	(4.169, 4.668)
Medicare Participation	Yes	49.863	2.131	23.40	<.001	(45.687, 54.040)
HCPCS code	99213	35.682	.285	125.24	<.001	(35.124, 36.240)
	99214	74.686	.551	135.61	<.001	(73.607, 75.765)
Number of Services		-.008	.0003	-26.43	<.001	(-.009, -.008)
Number of Medicare Beneficiaries		-.0136	.0005	-28.40	<.001	(-.015, -.013)
Average Medicare Standardized Amount		.583	.011	51.46	<.001	(.561, .605)

Table 6. Regression Model Parameter Estimates and Test for Their Significance with Average Submitted Charge Amount as Dependent Variable with Robust Standard Errors

		β	SE (β)	t	p	95% CI for β
Gender	Female	4.418	.130	34.09	<.001	(4.164, 4.672)
Medicare Participation	Yes	49.863	.961	51.86	<.001	(47.978, 51.747)
HCPCS code	99213	35.682	.272	131.18	<.001	(35.149, 36.215)
	99214	74.686	.566	131.90	<.001	(73.576, 75.795)
Number of Services		-.008	.0003	-26.66	<.001	(-.009, -.007)
Number of Medicare Beneficiaries		-.0136	.0005	-28.77	<.001	(-.014, -.013)
Average Medicare Standardized Amount		.583	.012	48.71	<.001	(.559, .606)

Results of t test for testing the significance of each predictor variable is also reported in Table 6. Gender reports significant effect on Average Submitted Charge Amount, adjusting for the effect of other predictor and control variables in the regression model. Precisely, estimate of the coefficient for female category is b1 = 4.418. This indicates that for a female physician, the Average Submitted Charge Amount is on an average, $ 4.418 higher than a male physician. The t test results indicate that null hypothesis of no significant effect of gender must be rejected at .05 level of significance

(t = 34.09, p = <.001). This indicates that controlling for HCPCS code, there is a significant difference in Average Submitted Charge Amount between male and female physicians. Precisely, the Average Submitted Charge Amount charged by female physicians is significantly higher than male physicians. Also, significant effect of HCPCS code is reported. HCPCS code 99212 is taken as reference or excluded category and dummy variables for HCPCS codes 99213 and 99214 are used in the regression model. The Number of Services reported significant effect on Average Submitted Charge Amount. More precisely, it reports significant negative association with Average Submitted Charged Amount adjusting for the effect of gender and HCPCS code and control variables (b = -0.008, t = -26.66, p = <.001).

The Durbin-Watson (DW) test was conducted to test autocorrelation in the regression model. Results of the DW test indicated that null hypothesis of no auto correlation cannot be rejected at a .05 level of significance (χ^2 (1) = 0.151, p = .697). Variance inflation factor (VIF) measure was computed for each predictor variable.

None of the predictor variables reported a large value of VIF with the highest VIF value being 1.56 for the Number of Medicare Beneficiaries. These results indicate that there is no problem of auto correlation and severe multicollinearity in the regression model and results of the regression model are valid.

Results of bivariate analysis and the subsequent regression analysis clearly indicated a significant effect of gender, HCPCS code and Number of Services on Average Submitted Charge charged. Female physicians reported significantly higher mean Average Submitted Charge Amount.

Table 7 reports estimates of model parameters of final regression model with Number of Services as the dependent variable with gender and HCPCS code taken as predictor variables. Average Medicare Allowed Amount, whether participating in Medicare or not, Average Submitted Charge Amount, Average Medicare Payment Amount, and Average Medicare Standardized Amount are taken as control variables. Fitted model reported a large number of outliers. To detect outliers, studentized residuals were used. Regression model was rerun excluding observations reporting an absolute studentized residual of more than 1.96. The revised fitted regression model is reported in Table 7.

However, the Breusch-Pagan test for heteroscedasticity in the model reported p value $p = <.001$ (χ^2 (1) = 36120.66, $p = <.001$) indicating heteroscedasticity or non-constant error variance problem in the model. To account for this problem, robust standard error measures were used and regression model was fitted again. Table 8 shows the results of the regression model with the use of robust standard errors. Fitted model reports R squared = 0.0623 indicating that predictor variables together account for 6.23% of the total variance in the Number of Services. Also, ANOVA test results indicate that null hypothesis of no significant overall model must be rejected at .05 level of significance (F (8, 581055) = 8524.63, $p = <.001$). This indicates that the overall model is statistically significant.

Table 7. Regression Model Parameter Estimates and Test for Their Significance with Number of Services as Dependent Variable

		β	SE (β)	t	p	95% CI for β
Gender	Female	-24.548	.443	-55.44	<.001	(-25.416, -23.681)
Medicare Participation	Yes	73.707	7.455	9.89	<.001	(59.095, 88.320)
HCPCS code	99213	160.884	2.331	69.02	<.001	(156.315, 165.453)
	99214	264.529	5.069	52.19	<.001	(254.594, 274.464)
Average Medicare Allowed Amount		-1.021	.0743	-13.74	<.001	(-1.167, -.875)
Average Submitted Charge Amount		-.185	.0036	-51.52	<.001	(-.192, -.178)
Average Medicare Payment Amount		2.706	.0851	31.81	<.001	(2.539, 2.873)
Average Medicare Standardized Amount		118.535	8.178	14.49	<.001	(102.506, 134.564)

Table 8. Regression Model Parameter Estimates and Test for Their Significance with Number of Services as Dependent Variable with Robust Standard Errors

		β	SE (β)	t	p	95% CI for β
Gender	Female	-24.548	.416	-59.03	<.001	(-25.364, -23.733)
Medicare Participation	Yes	73.707	4.421	16.67	<.001	(65.043, 82.372)
HCPCS code	99213	160.884	1.842	87.33	<.001	(157.273, 164.495)
	99214	264.529	4.040	65.48	<.001	(256.610, 272.447)
Average Medicare Allowed Amount		-1.021	.0576	-17.72	<.001	(-1.134, -.908)
Average Submitted Charge Amount		-.185	.0035	-52.46	<.001	(-.192, -.178)
Average Medicare Payment Amount		2.706	.0574	47.11	<.001	(2.594, 2.819)
Average Medicare Standardized Amount		118.535	5.142	23.05	<.001	(108.456, 128.613)

Results of t test for testing the significance of each predictor variable is also reported in Table 8. Gender reports significant effect on Number of Services, adjusting for the effect of other predictor and control variables in the regression model. Precisely, estimate of the coefficient for female category is b1 = - 24.548. This indicates that for a female physician, the Number of Services is on an average, 24.548 lower than a male

physician. The t test results indicate that null hypothesis of no significant effect of gender must be rejected at .05 level of significance (t = -59.03, p = <.001). This indicates that controlling for HCPCS code, there is a significant difference in Number of Services between male and female physicians. Precisely, the Number of Services by male physicians is significantly higher than female physicians. Also, significant effect of HCPCS code is reported. HCPCS code 99212 is taken as reference or excluded category and dummy variables for HCPCS codes 99213 and 99214 are used in the regression model.

Variance inflation factor (VIF) measure was computed for each predictor variable. None of the predictor variables reported a large value of VIF with the highest VIF value being 1.65 for the Average Submitted Charge Amount. These results indicate that there is no problem of auto correlation and severe multicollinearity in the regression model and results of the regression model are valid.

Results of bivariate analysis and the subsequent regression analysis clearly indicate a significant effect of gender on Number of Services. Male physicians reported significantly higher mean Number of Services than females.

CHAPTER IV

DISCUSSION

This study provided additional information to the discussion of gender wage gap in the medical industry. This study found that, based on the CMS dataset for CY 2015, female physicians, on average, had significantly higher Average Submitted Charge Amounts than male physcians for HCPCS codes 99212, 99213, and 99214.

Additionally, the study found that male physicians, on average, had significantly higher Number of Services compared to females. Also, male physicians, on average, had significantly higher Number of Medicare Beneficiaries compared to females. Important physician characteristics such as age, race, marital status, years of working, etc, are not controlled in this study which is a major limitation. Those personal characteristics are important confounding factors.

There is a need for additional studies to answer:

- Do male physicians spend less time with each patient than female physicians?

- Do male physicians work more hours per week than female physicians?

- What are the average years in practice for male physicians and female physicians?

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APPENDICES

APPENDIX A

THE PROBLEM

Statement of the Problem

John F. Kennedy signed the Equal Pay Act of 1963 into law more than fifty years ago to eliminate wage disparity due to gender, yet the wage gap continues to exist. The wide array of possible causes for the wage gap among practicing physicians warrants a more specific and scientific examination. There is a need to focus on a specific subset of practicing physicians to ascertain if fee schedule construction is a contributing factor to the physician wage gap. Learning more about the relationship between physician gender and billed charges and case volume for services routinely performed in the private practice setting may identify another contributor to the wage gap among healthcare professionals: the fee schedule.

Research Questions

1. Is there a relationship between physician gender and billed charge amount? Do female physicians charge less than their male counterparts for the same services?

2. Is there a relationship between physician gender and case volume? Do female physicians have fewer patients than male counterparts? (Lower case volume could result from choosing to work fewer hours or spending more time with each patient.)

3.   Is there a relationship between distribution of 99212, 99213, and 99214 (or office
      visit mix) and physician gender?

      Do female physicians code lower level visits more frequently than male physicians do?

4.   Is there a relationship between case volume and billed charges?

      Do busier physicians (high case volume) charge more than lower volume
      physicians?

Experimental Hypotheses

Hypothesis 1:

      There is a relationship between billed charges for HCPCS codes 99212, 99213,
and 99214 and gender for private practice physicians in the United States.

      If there is variation in the form of females having lower billed charges than the
male counterparts, it may imply that part of the pay inequality for this population is
caused by lower billed charges.

Hypothesis 2:

      There is a relationship between case volumes for HCPCS codes 99212, 99213,
and 99214 and gender for private practice physicians in the United States.

      If female physicians demonstrate lower case volume (either due to working fewer
hours than males, or spending more time with each patient) than their male
counterparts, it may imply that smaller case volume is contributing to the gender wage
gap among healthcare professionals. Fewer number of services equates to fewer
billable charges, fewer claims and less revenue.

Hypothesis 3:

      There is a relationship between distribution of office visit level for HCPCS codes 99212, 99213, and 99214 and gender for private practice physicians in the United States.

      Perhaps female physicians are more likely to down code their office visits, resulting in lower payment.

Hypothesis 4:

      There is a relationship between billed charges compared to case volume and gender for HCPCS codes 99212, 99213, and 99214 for private practice physicians in the United States.

      Perhaps higher case volume physicians leverage it with private payers to negotiate a higher reimbursement.

<div align="center">Assumptions</div>

      Generally, physicians have two fee schedules. One fee schedule is applied to all payers, both public (Medicaid, Medicare, Tricare) and private (United HealthCare, Aetna, Anthem, etc). The second, optional fee schedule allows providers to offer discounted rates for uninsured or cash pay physicians. This research project assumes that the billed charges represented in the Medicare Provider Utilization and Payment Data: Physician and Other Supplier Public Use File for calendar year 2015 are identical to the billed charges used with private payers. This represents cohesion to standard medical billing practices. This study also assumes that private payers reimburse physicians at a higher rate than Medicare.

Delimitations

This study has delimitations. Firstly, because of the dataset available, the study only looks at physicians who filed claims with Medicare in 2015.

This study examines only three services, all performed at the physician office setting. Procedures were selected for analysis based on significant occurrence and significant revenue. Evaluation and management codes are the most commonly coded across provider specialties.

The procedures selected, from the 2017 CPT® Professional Manual, include:

99212   Office or other outpatient visit for the evaluation and management of an established patient…Usually, the presenting problem(s) are self limited or minor. Typically 10 minutes are spent face-to- face with the patient and/or family.

99213   Office or other outpatient visit for the evaluation and management of an established patient…Usually, the presenting problem(s) are of low to moderate severity. Typically 15 minutes are spent face-to-face with the patient and/or family.

99214   Office or other outpatient visit for the evaluation and management of an established patient…Usually, the presenting problem(s) are of moderate to high severity. Typically 25 minutes are spent face-to-face with the patient and/or family.

Limitations

The Centers for Medicare & Medicaid Services (2017) state:

While the Physician and Other Supplier PUF has a wealth of information on payment and utilization for Medicare Part B services, the dataset has a number of limitations. Of particular importance is the fact that the data may not be representative of a physician's entire practice as it only includes information on Medicare fee-for-service beneficiaries. In addition, the data are not intended to indicate the quality of care provided and are not risk-adjusted to account for differences in underlying severity of disease of patient populations. (Medicare Provider Utilization and Payment Data: Physician and Other Supplier Public Use File CY 2014, 2017).

Also, important physician characteristics such as age, race, marital status, years of working, etc, are not controlled in this study which is a major limitation. Those personal characteristics are important confounding factors. An additional limitation regarding the dataset, from "Medicare Fee-For-Service Provider Utilization & Payment Data Physician and Other Supplier Public Use File: A Methodological Overview" (2017) includes: "To protect the privacy of Medicare beneficiaries, any aggregated records which are derived from 10 or fewer beneficiaries are excluded from the Physician and Other Supplier PUF."

Significance of the Study

Study results might inform private practice physicians about determining appropriate charge amounts and whether and how they should adjust their fee schedules. Reaction to the findings from this study could ultimately lead to a better understanding of the gender wage gap among male and female physicians.

This study determined female physicians had significantly higher Average Submitted Charge Amounts than males.

Additionally, this study could bring attention to the importance of fee schedule setting on behalf of a physician, regardless of gender. Although it is important to set one's fee schedule appropriately, it is equally important to update and review the fee schedule regularly.

The study determined a statistically significant variance in Number of Services. Male physicians on average, have a significantly higher Number of Services than females. The study found female physicians bill a smaller portion of lower level office visits than male physicians.

APPENDIX B

LITERATURE REVIEW

Introduction

Numerous studies compose the body of literature regarding the gender wage gap among physicians, many having conflicting views. Studies include government reports, labor and census statistics, and peer-reviewed journal submissions. Researchers argue about the potential causes of the gender wage gap, as well as which factors should be filtered out of calculations in order to reflect the true gap such as taking into account differences in work hours, work weeks, job titles, experience, and education. Interestingly, there is a small population of authors who deny the gender wage gap exists and believe it to be a myth, purported by feminists to advance a liberal agenda. This physician gender wage gap literature review is organized by:

- Gender Wage Gap

- Causes

- Specialty

- Academic Institutions

- Private Practice

- Possible Solutions

- Physician Fee Schedule

- Contract Negotiation

- Literature Review Summary

Gender Wage Gap

The gender wage gap isn't as simple as newspapers make it seem. The approximately twenty-percent gap is an aggregate, an average of earnings by "full-time, year-round workers who are 15 years and older" (U.S. Census Bureau, 2016). A full-time worker is defined as one who "worked at least 35 hours per week (full time), and at least 50 weeks during the previous calendar year (year round)" (U.S. Census Bureau, 2016). While it is a good indicator, it leaves out some important nuances. The wage gap as reported by the Census Bureau is not job specific and it doesn't evaluate factors that affect annual earnings like hours worked per week (in excess of thirty five), years of experience, or tasks performed. While the gap has narrowed consistently since the 1970's, at the current rate, it is estimated that the gap won't close until 2059 (Joint Economic Committee, 2016).

Additionally, not everyone believes the pay gap exists, at least not due to discrimination as most mainstream media depicts it. According to Bourree Lam (2016), "the gap isn't real" and "men and women aren't paid the same amount of money because they are choosing to go into different professions, and the labor market rewards their choices differently." In other words, women earn less because they choose lower paying jobs. Occupational gender segregation reflects the idea that occupations predominately filled by females tend to be lower paying then male dominated occupations. Unequal work results in unequal pay.

The consequences of the gender wage gap are far reaching and grow over the course of a female's career and work life. The Economic Committee Report (2016) estimates that the impact of lower pay costs a woman "close to half a million dollars over the course of her career." Many employers give cost of living increases annually in the form of an added percentage of the previous years earnings. The lower wage leads to a reduced annual increase. Another employer benefit is the 401(k) match, again, paid as a percentage of the employee wages. Lower wages equate to smaller corporate matching funds in retirement accounts and consequently a reduction in the deferred tax growth over the lifetime of the employee. Finally, less money earned over one's lifetime results in less paid into social security leading to smaller retirement payments.

Doximity.com, an online social networking service for U.S. physicians published the "First Annual Physician Compensation Report" in April, 2017. Doximity queried 36,000 physicians and determined female physicians were paid less in every city and in every specialty. "The average national gender gap among physicians is 26.5 percent less per year, meaning that on average, female doctors make $91,284 less than what the average male doctor makes" (First Annual Physician Compensation Report, 2017).

The physician compensation report (First Annual Physician Compensation Report, 2017) concluded that the study:

"uncovered significant disparities in compensation between male and female physicians across specialties, metro areas, and all states. This data was consistent with previous studies in the physician labor market,

and aligns with a persisting gap found between male and female employees in the general labor markets. It's beyond our scope to speculate on causation of this effect, but our data indicates that this presents a very real trend that the system will need to address."

Causes

Prior research has divided causes of the pay gap into three distinct categories: human capital variances, differences in working conditions, and discrimination in pay, employment and promotion (Jacobsen, 2016). Human capital variances include education, psychological attributes, qualifications, and skill sets as well as association and society memberships and fellowships. Working condition differences equate, in the medical profession, to geographical locations, sites of service (hospital, physician office, academic setting, ambulatory surgery centers), the local payer mix, and the local wage index.

The Medicare allowed rate is influenced by the local wage index. Providers who live in locales with a higher cost of living bear the burden of more expensive office real estate and higher labor costs, but also reap the benefit of increased payments from Medicare. Inversely, providers practicing in regions with a lower than average wage index will incur Medicare payments below the national average.

Discrimination in pay, promotion or employment takes many forms. It may be not offering a female physician more money than a man because she is not perceived as a head of household. Employers may refrain from promoting a female for fear that she

will disengage to have children or take care of elderly parents. One form of pay discrimination is nonlinear compensation, a compensation plan whereby one gets paid exponentially more for the additional hours one works. Nonlinear compensation, where workers are paid disproportionately more for working more, negatively affects the compensation of a female who may not have the flexibility to work many extra hours due to obligations at home.

According to the Pew Research Center (Brown & Patten, 2017), women are "more likely to say they had taken breaks from their careers to care for their family" or had "quit altogether to take care of these familial responsibilities." Work force interruption is presumed to be a common and logical cause of the wage gap.

Occupational gender segregation contributes to the wage gap and exists in the medical profession, as well as the overarching work force. A study in the Journal of the American College of Surgeons found that female physicians were under represented in many specialties: urology, neurosurgery, general surgery, orthopedics and radiology (Jagsi, Griffith, DeCastro, & Ubel, 2013). One female physician noted, "Orthopedic surgery is still very male dominated and it's one of those fields where the culture of the specialty reflects a 'boy's boy' image. I don't think many women have known how to fit into that group or feel particularly motivated to deal with it" (Vassar, 2015).

Pay secrecy, a work environment where employees are discouraged from discussing their pay, has contributed to the wage gap. "Between 2000 and 2014 eight additional states--Colorado, Illinois, Louisiana, Maine, Minnesota, New Jersey, Vermont, and New Hampshire--enacted "pay secrecy" Laws" (Pay Secrecy, 2014). Those states joined Michigan and California, which enacted their Pay Secrecy Laws in

the 1980's, making it illegal to retaliate against an employee for disclosing his wages or make it an employment requirement to keep pay secret. In summary, ten states make Pay Secrecy Policies illegal, while forty states allow it. Employers gain an advantage when employees are discouraged from discussing their pay with colleagues. The Institute for Women's Policy Research (2010) found that "62 percent of women in the private sector felt they were strongly discouraged from discussing wages or feared repercussions from doing so." By perpetuating the fear of retaliation for sharing pay information, employers make it more difficult for underpaid employees to realize the disparity, and consequently push for increased compensation.

One factor blamed for the wage gap that appeared numerous times and was cited from both men and women was "women's lack of negotiation skills." Repeatedly listed as a potential cause of the gap in general, and the gap among physicians, was the notion that females are not as comfortable or adept at negotiating on their own behalf as males. The American Academy of Family Physicians (AAFP) president Wanda Filer, MD, MBA, stated, "some women are not comfortable negotiating for themselves. We are better advocates for others. We need to do a better job advocating for what we want" (Laff, 2016). For the female physician, the risk regarding negotiation is being perceived as pushy. Bowles, Babcock, and Lai found that men were less likely to hire a female who negotiated her salary (2007).

Physician Specialty

By looking within a profession and analyzing at a specialty level, one would expect the wage gap to close, as researchers are removing variables like education and

job titles that sometimes confound data. In "Equal Pay Day: a wage gap fact check,"

Chalabi claimed that in 2016, "female physicians and surgeons earned a paltry 63 cents

for every dollar their male counterpart earned" (2017).

Researchers routinely argue that there are not enough factors taken into account

when filtering for the wage gap and propose their own methods for controlling

confounding factors. Desai and others (2016) instituted a proprietary calculation aimed

at using "objective, non-self-reported data" and still found the disparity to be

approximately $19,000 across all thirteen of the specialties under review.

Some research has shown there are places where the wage gap doesn't exist,

such as the pharmacy workplace, called "the most egalitarian profession" due to its

linear compensation, which has resulted in a near elimination of the gender wage gap

(Goldin & Katz, 2016).

In science and health professions, "workers are more likely to be compensated at

a constant rate for additional time worked" (Bolotnikova, 2016). Bolotnikova estimates

that the wage gap in those professions is closer to .892 (women earning 89.2 cents for

every dollar that their male counterpart earns).

<div align="center">Academic Institutions</div>

There is a significant amount of literature regarding the gender wage gap in the

healthcare profession focusing on medical professionals employed by academic

institutions. Most institutional physicians are paid salaries, and sometimes are

incentivized by bonus schedules after meeting productivity objectives. In a large study

published in JAMA (Jena, Olenksi, & Blumenthal, 2016), researchers found, out of the

twenty-four public medical schools examined, only two paid men and women equally. The same study determined that radiology was the only specialty demonstrating wage parity within the examined academic institutions (Jena, Olenksi, & Blumenthal, 2016).

Private Practice

Private practice physicians are uniquely compensated for their work. Physicians in private practice earn wages by performing services, billing and coding for them. Currently, available general wage gap research measures weekly income or annual income, but unaccounted variables such as "hours worked" could skew the data and outcomes.

Possible Solutions

Across the board, studies recommended many solutions to aid in reducing the gender wage gap. The only consensus among the literature was that the wage gap is a complicated issue with many contributing factors. Some posit that employers need to roll out linear compensation plans and, as a minimum, conduct salary audits to monitor gender pay disparities.

Other researchers blamed society for imposed gender roles, gender stereotypes (women will quit to have children), and the consequential gender occupational segregation. Much research supports society reviewing cultural norms and expectations of what role women play in the household and in regards to child rearing. Also, that as a community, society needs to stop teaching young girls not to excel in studies that result in higher pay such as math and sciences and encourage women to

work in male dominated fields like medicine and engineering. Interestingly, in 2015 almost as many women graduated from U. S. medical schools as men. Females made up 48% of the 2015 U.S. medical school graduates (The Kaiser Family Foundation, 2017) (see Table 3). Although, while more females graduating from medical school does not necessarily equate to pay standardization within the healthcare professions, it at least demonstrates an improvement in occupational gender segregation.

Table 1. Distribution of Medical School Graduates by Gender

Location	Female	Male	Total
United States [1]	8,907	9,798	18,705
1. New York	857	952	1,809
2. Texas	700	771	1,471
3. Pennsylvania	632	620	1,252
4. Illinois	550	532	1,082
5. California	531	549	1,080
6. Ohio	458	530	988
7. Florida	364	417	781
8. Michigan	336	358	694
9. Massachusetts	318	318	636
10. Virginia	242	285	527
11. Missouri	260	257	517
12. Georgia	255	255	510
13. Louisiana	211	263	474
14. North Carolina	231	234	465
15. District of Columbia	227	217	444

Dr. Suzanne Harris, president of the American Medical Women's Associations said eliminating the pay gap "requires a systematic response. In addition to beefing up training for their doctors, healthcare organizations must examine their own pay inequities – across gender and race – and devise ways to address them" (Ross, 2017).

Fee Schedules

The physician fee schedule is a list of all the services performed by a physician or practice, and the corresponding fees associated with each service. The ability to set one's charges is unique to private practice physicians and groups, providing them, to a certain degree, autonomy and control over what they earn. Additionally, private practice providers can choose which insurances to accept and which to reject.

For an individual practicing provider, setting a fee schedule can be an arduous task. A provider must determine the rates for every procedure code for which he intends on performing, documenting, coding and billing. This creates a challenge for many providers, especially if they have not sought reimbursement counsel from an experienced healthcare biller, preferably with ample experience in the provider's specialty. Some sources recommend algorithms by which a provider should set his fee schedules, but, regardless of the many advices, there remains no one concrete methodology.

Physicians use any number of rationales when developing their fee schedules; some seemingly use no rationale at all, but merely select a random charge. Some physicians set their fee schedules as a multiple of the Medicare allowable for a particular service. In such cases, depending on the authority, a provider may feel it is appropriate to bill three, four or even ten times the Medicare allowable. Some providers pick a high watermark, choosing to set their schedule based on the highest reimbursement they have received. Other providers simply bill one hundred percent of the Medicare allowable (not recommended), although the most common is 250% of the Medicare allowed rate (Woodcock, 2002).

When setting a fee schedule, the physician should consider his costs for running the practice, as well as the costs for performing specific services. In the case of a self-pay (or uninsured) patient, a thorough understanding of the cost of maintaining the practice is necessary to determine a fair, discounted cash rate. Medicare allows

providers to offer a discounted rate for uninsured physicians. Outside of this exception, a physician must use the same fee schedule for all payers, including Medicare.

Perhaps the most uniformly recommended suggestion is not surprisingly the most logical, and defendable. The provider is directed to assess the costs of running his business and take it into account when setting his fee schedule. This requires assessing rent, malpractice insurance, payroll, taxes and employee benefits among other things. Reviewing the actual cost of operating a practice seems logical, but it is a time consuming task.

<center>Contract Negotiation</center>

Negotiation skills are not just useful when accepting an offer of employment, in which case one might negotiate a higher bonus percentage, more vacation time or a higher salary, but they are crucial when negotiating a private payer case carve out or a reimbursement based on a percentage of billed charges or a factor of Medicare.

Negotiating with private payers for contract rates and carve outs is an important component of running a private practice. A physician with poor negotiating skills will end up with poor results and reduced compensation. Private payers generally offer a standard rate with a contract and may claim that there is no room for negotiation. A savvy physician will not accept a standard rate and will insist on some concessions, likely demonstrating a solid business reason such as better outcomes than his competitors. Dr. Suzanne Harris, president of the American Medical Women's Associations, said, "Women are less comfortable negotiating…they haven't had the training to feel comfortable in that role of asking for more" (Ross, 2017).

<center>45</center>

Improving private payer reimbursement is critical to the financial health of a practice, yet many practices fail to review their contracts regularly, request changes during the allowed modification period, or ask for annual increases.

Literature Review Summary

The body of research that exists identifies many potential causes of the gender wage gap within the healthcare community, and also recommends solutions. More research needs to be done on specific subsets of the healthcare sector to ascertain if there are contributors to the wage gap that can be corrected through fee schedule manipulation.

APPENDIX C

ADDITIONAL RESULTS

Histograms
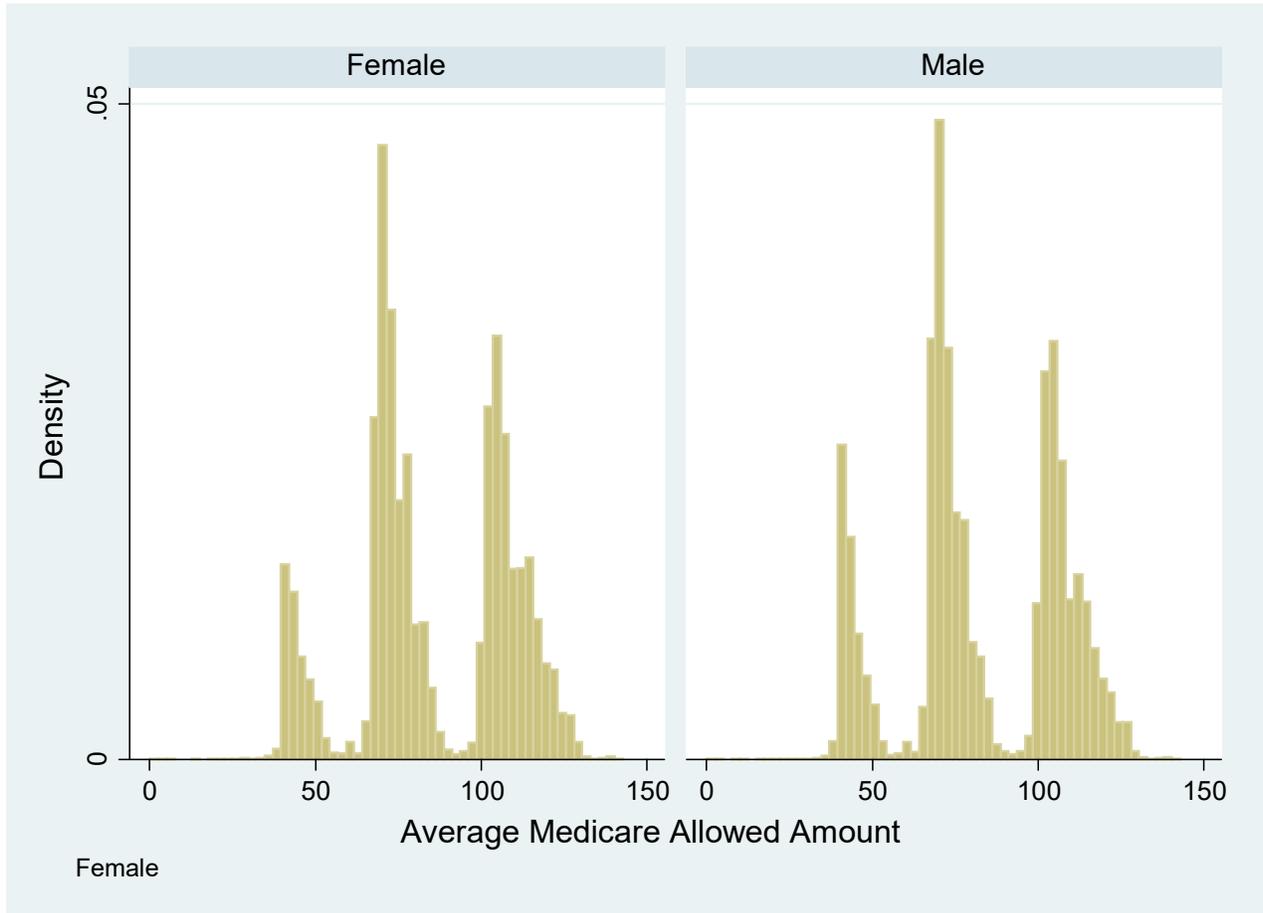
Figure 1. Histogram of Average Medicare Allowed Amount across Gender
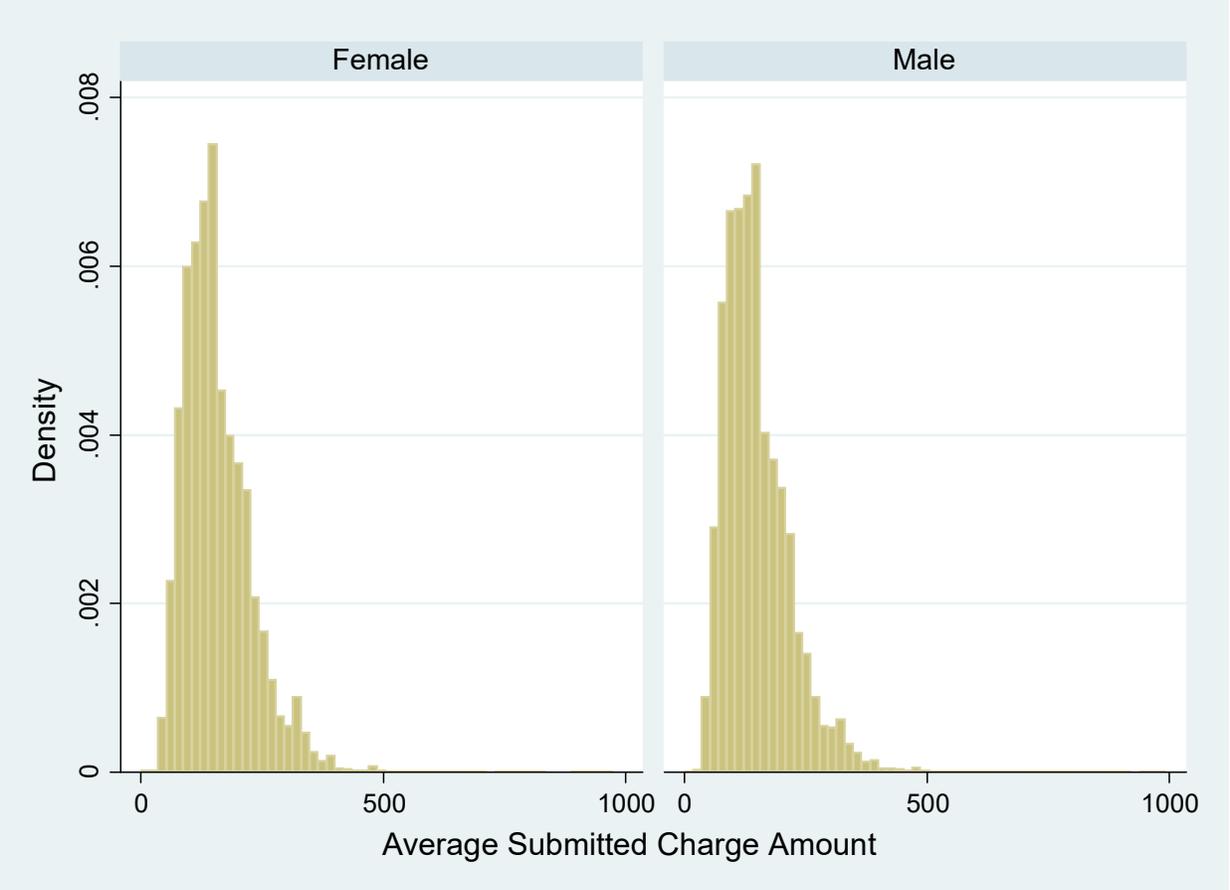
Figure 2. Histogram of Average Submitted Charge Amount across Gender
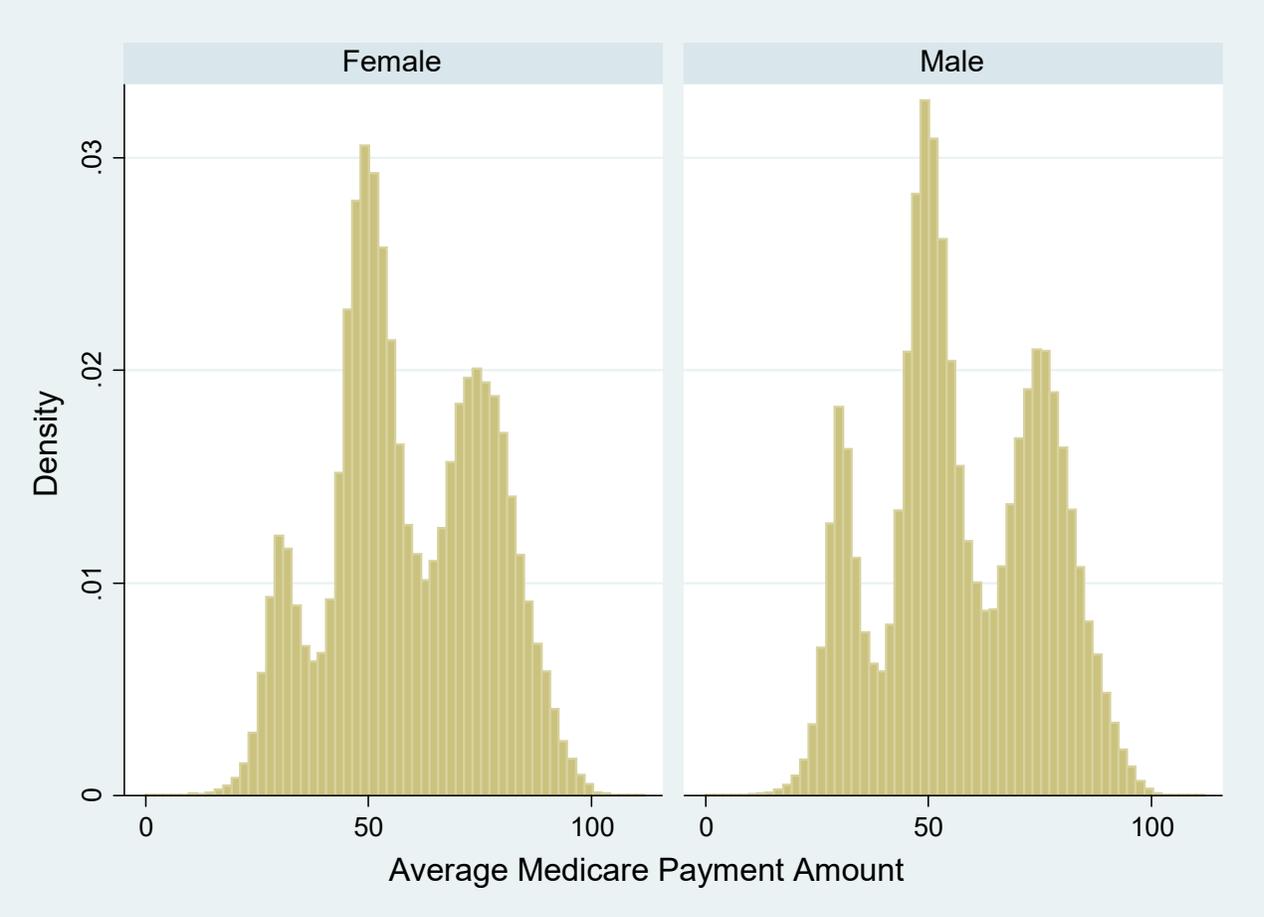
Figure 3. Histogram of Average Medicare Payment Amount across Gender
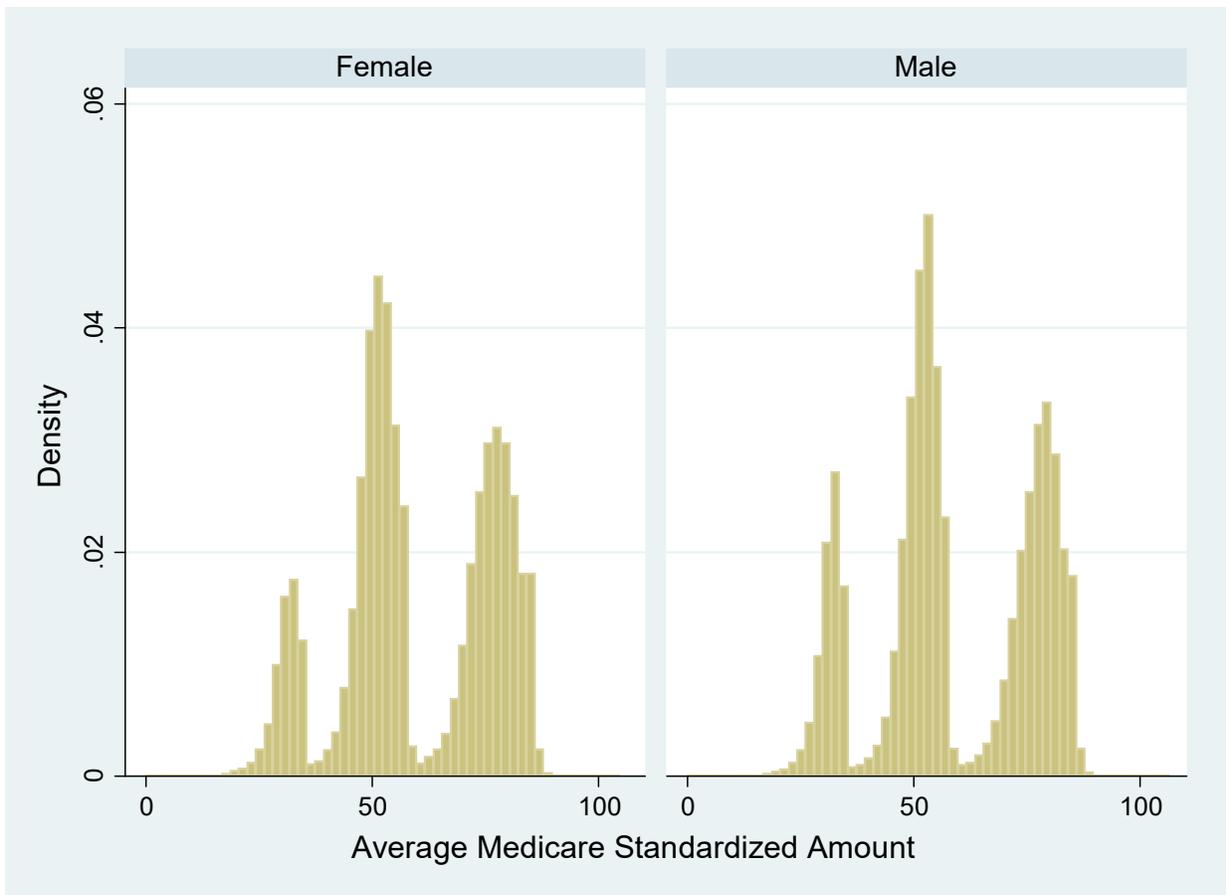
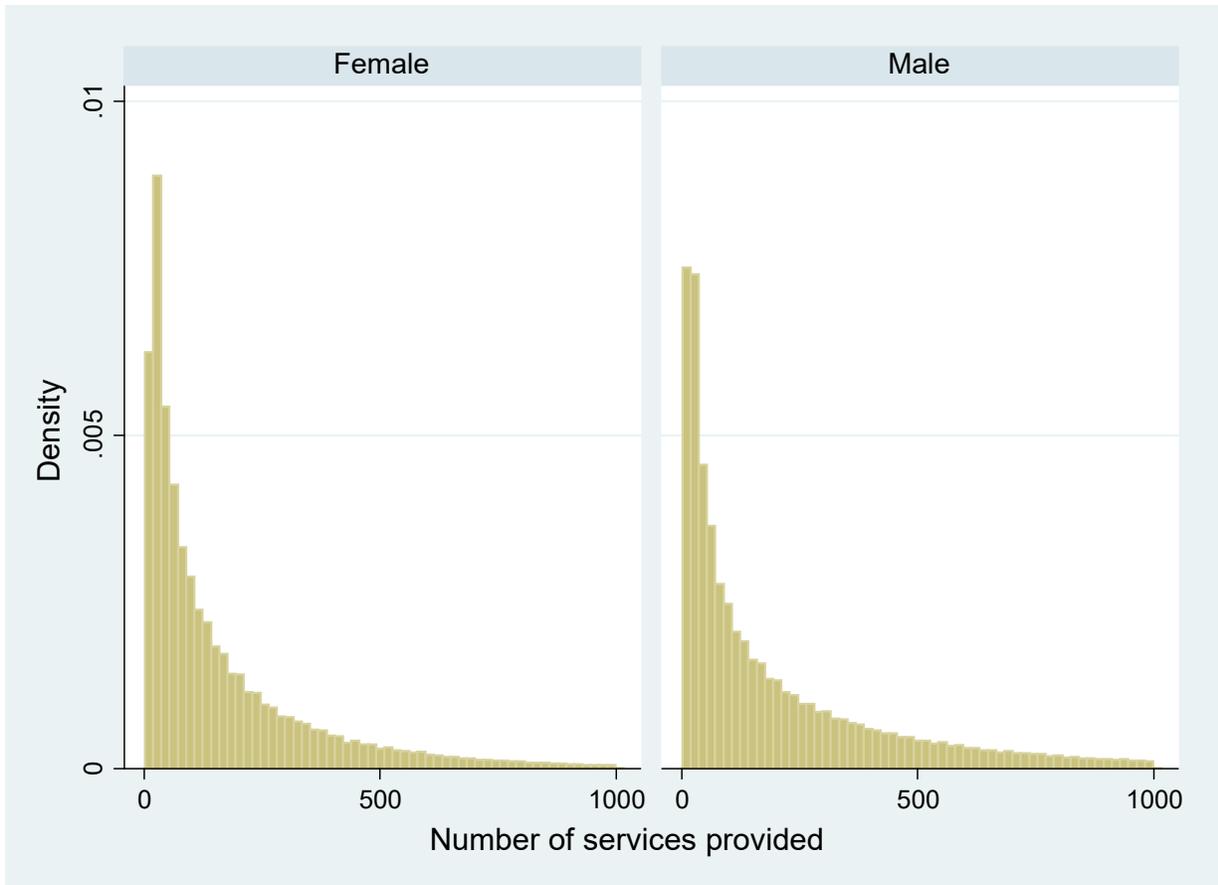Figure 4. Histogram of Average Medicare Standardized Amount across Gender

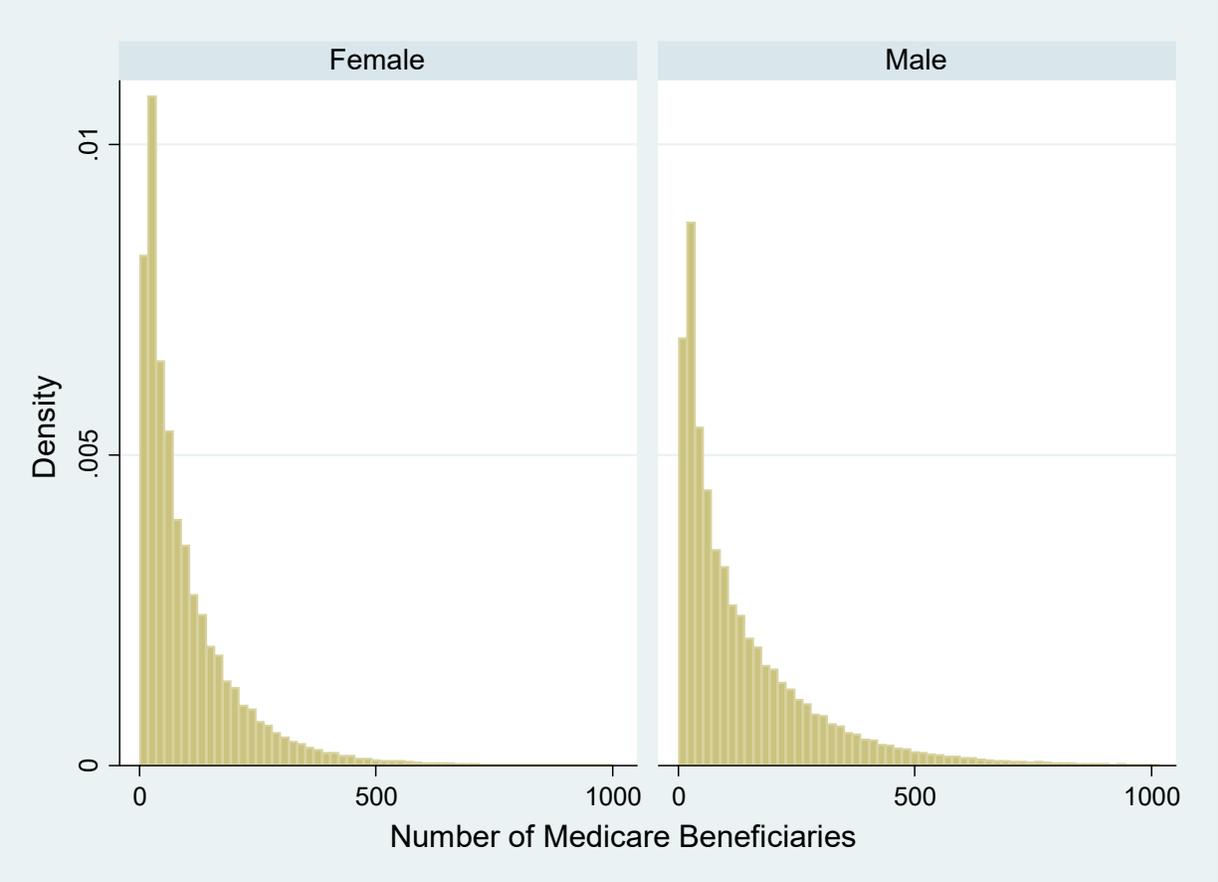Figure 5. Histogram of Number of Services Provided Across Gender

Figure 6. Histogram of Number of Medicare Beneficiaries across Gender
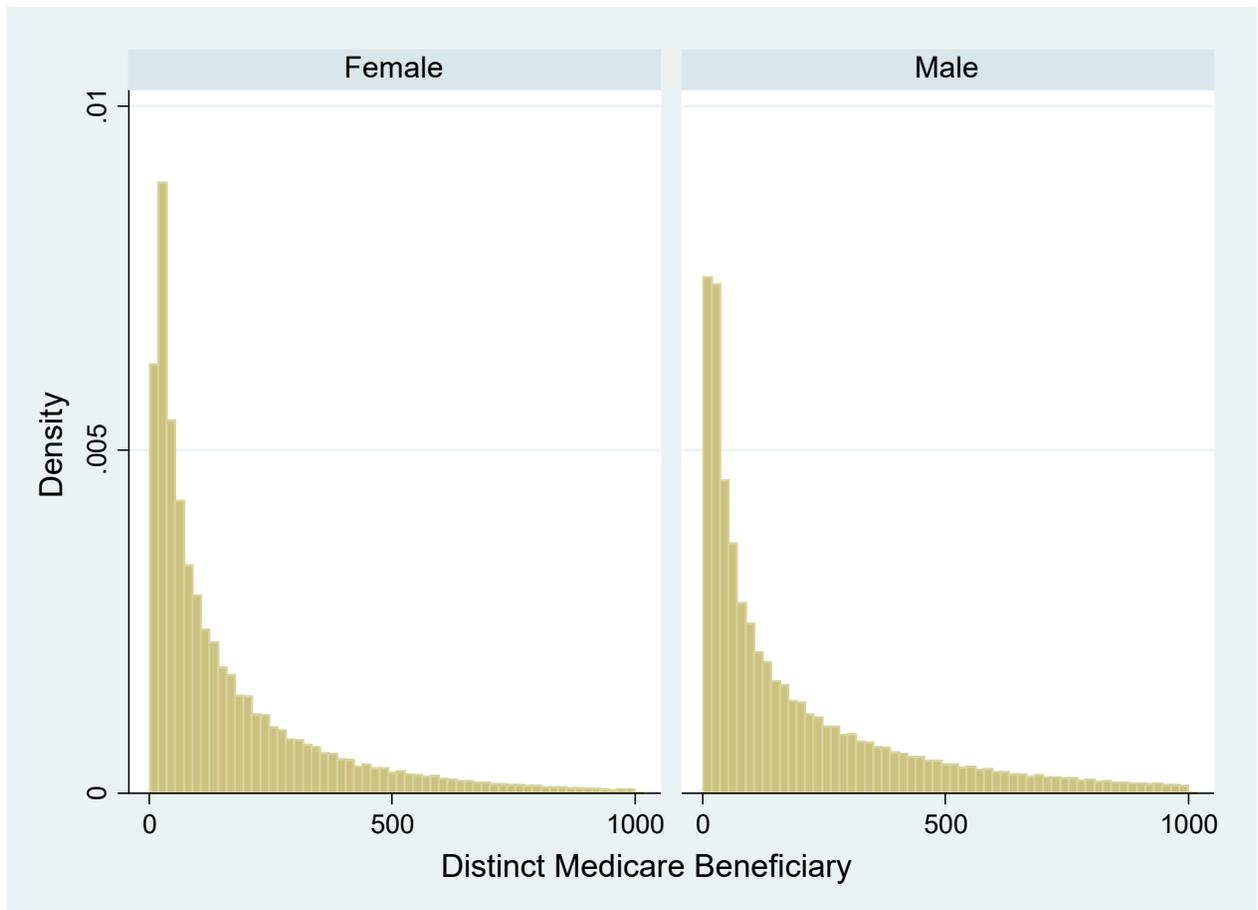
Figure 7. Histogram of Distinct Medicare Beneficiaries/Per Day Services across Gender

APPENDIX D

MANUSCRIPT DEVELOPED FOR SUBMISSION TO JAMA

Variances in Physician Compensation:
Examining Differences in Average Submitted Charge Amount and Number of Services
Between Male and Female Physicians

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Manuscript Word Count: 546

Many published studies document a wage gap between male and female physicians.   According to the "First Annual Physician Compensation Report," published April, 2017 by Doximity, there are "significant disparities in compensation between male and female physicians across specialties, metro areas, and all states…It's beyond our scope to speculate on causation of this effect, but our data indicates that this presents a very real trend that the system will need to address." [1]   A private practice physician's fee schedule and practice volume represent key components in overall compensation. Understanding if there are differences in billed charges and case volume between male and female physicians could help to explain part of the documented wage gap among physicians.

Methods:

By reviewing a public data set, the Medicare Provider Utilization and Payment Data: Physician and Other Supplier Public Use File for calendar year 2015[2] we conducted a quantitative, cross sectional research study which examined the following claims data for male and female private practice physicians: Average Submitted Charge Amounts and Number of Services for HCPCS codes 99212, 99213, and 99214.

Pearson's product-moment correlation was run to assess the relationship between the criterion variable and the predictor variables. Multivariable linear regression analyses were performed to evaluate the effect of both categorical and quantitative predictor variables using Average Submitted Charge Amount and Number of Services as dependent variables. Breusch-Pagan test was used for heteroscedasticity and Durbin-Watson test was conducted for autocorrelation. Severity

of multicollinearity was assessed using measure of Variance Inflation Factor (VIF). All tests were performed with p < .05 indicating statistical significance using STATA (StataCorp) version 15.0.

Results:

After reviewing 620,448 claims for HCPCS 99212, 99213, and 99214, we found that male physicians had mean Average Submitted Charge Amounts of M = 149.955 (SD = 69.493) and females had M = 157.908 (SD = 69.746) (Difference in mean = 7.953, p = <.001). Results of bivariate analysis and the subsequent regression analysis clearly indicated a significant effect of gender on Average Submitted Charge Amount. Adjusting for the effect of other predictor and control variables in the regression model, the estimate of the coefficient for female category is b1 = 4.418, indicating that for a female physician, the Average Submitted Charge amount is on average, $4.418 higher than a male physician (95% CI, 4.164-4.672).

We found that male physicians had significantly higher mean Number of Services (M = 199.497 (SD = 223.067)) than female physicians (M = 164.686 (SD = 186.779)) (Difference in mean = 34.811, p = <.001). Results of bivariate analysis and the subsequent regression analysis clearly indicated a significant effect of gender on Number of Services. Adjusting for the effect of other predictor and control variables in the regression model, the estimate of the coefficient for female category is b1 = -24.548, indicating that for a female physician, the mean Number of Services is on average, 24.548 lower than a male physician (95% CI, -25.364, -23.733).

Discussion:

This study provided additional information regarding wage inequality in the medical industry. This study found that, based on the CMS dataset for CY 2015, female physicians, on average, had significantly higher Average Submitted Charge Amounts than male physcians for HCPCS codes 99212, 99213, and 99214. Additionally, the study determined that male physicians had signifcantly higher Number of Services than female physicians.

Table 1. Regression Model Parameter Estimates and Test for Their Significance with Average Submitted Charge Amount as Dependent Variable with Robust Standard Errors

		β	SE (β)	t	p	95% CI for β
Gender	Female	4.418	.129	34.09	<.001	(4.164, 4.672)
Medicare Participation	Yes	49.863	.961	51.86	<.001	(47.978, 51.747)
HCPCS code	99213	35.682	.272	131.18	<.001	(35.149, 36.215)
	99214	74.686	.566	131.90	<.001	(73.576, 75.795)
Number of Services		-.008	.0003	-26.60	<.001	(-.009, -.007)
Number of Medicare Beneficiaries		-.0136	.0004	-28.77	<.001	(-.014, -.013)
Average Medicare Standardized Amount		.583	.012	48.71	<.001	(.559, .606)

Table 2. Regression Model Parameter Estimates and Test for Their Significance with Number of Services as Dependent Variable with Robust Standard Errors

		β	SE (β)	t	p	95% CI for β
Gender	Female	-24.548	.416	-59.03	<.001	(-25.364, -23.733)
Medicare Participation	Yes	73.707	4.421	16.67	<.001	(65.043, 82.372)
HCPCS code	99213	160.884	1.842	87.33	<.001	(157.273, 164.495)
	99214	264.529	4.040	65.48	<.001	(256.610, 272.447)
Average Medicare Allowed Amount		-1.021	.0576	-17.72	<.001	(-1.134, -.908)
Average Submitted Charge Amount		-.185	.0035	-52.46	<.001	(-.192, -.178)
Average Medicare Payment Amount		2.706	.0574	47.11	<.001	(2.594, 2.819)
Average Medicare Standardized Amount		118.535	5.142	23.05	<.001	(108.456, 128.613)

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