

Patient Satisfaction with Clinician at GroupHealth

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Introduction

Patient satisfaction surveys have become one of the most valuable tools in gauging physician-patient relationships and the patient's overall satisfaction with the clinician. It allows an organization to capture standardized data on self-reported patient encounter assessments to gain insight regarding the patient experience and care received. Specifically, Group Health's patient satisfaction surveys focused on the patient's satisfaction with the clinician (clinician satisfaction) to be used as a measuring tool to translate improvement categories and ratings of the clinician into meaningful, quantifiable, and actionable data. The goal of this study is to examine patient satisfaction survey results for the patient's clinician satisfaction to determine which aspects of the patient's care encounter contribute to a favorable clinician rating. The purpose of the study is to recognize trends among the Group Health patient satisfaction survey data as a method to supply recommendations in order to improve clinician performance and ensure excellence in Group Health's individualized physician-patient care experience.

Background

During the mid-1900s US citizens could not enjoy good health at an affordable cost. From this came the formation of Group Health. In Seattle, 1945, Group Health was incorporated, becoming one of the first organizations to provide both full insurance coverage and comprehensive medical care. Group Health Cooperative (now Kaiser) serves more than 600,000 residents in Washington and Northern Idaho. As a non-profit health system, Group Health continues to transform and strive to not only provide quality care, but to also provide an excellent healthcare experience for patients.

The analysis that will follow will focus on patient satisfaction with clinicians amongst several different specialties. The data utilized in this analysis was taken from the Group Health data rolling twelve data set from 2008. The study was conducted by distributing patient satisfaction surveys and the use of this data will be seen below.

Literature Review

The measurement of Patient Satisfaction began in the 1980s and is now integrated into many physician practices (Kash, 2017). Multiple factors influence overall patient satisfaction including wait times and communication to name a couple. A patient's time spent with their physician as well as waiting to see their physician heavily influenced their overall satisfaction of care. Physicians that saw their patients sooner and spent longer with their patient had an average score of 92.7 (Anderson, Camacho, Balkrishnan, 2007). In contrast, physicians that made their patients wait longer and spent less time with them had an average score of 18.0 (Anderson, Camacho, Balkrishnan, 2007). Increasing the time spent with physicians and reducing the wait times for appointments would improve patient satisfaction and overall clinician rating.

Another study evaluated specific wait time lengths and clinician ratings. This study showed that the shorter the time a patient waited (about 13 minutes), the better the rating was for the clinician

(5 star rating scale) (Businesswire, 2017). Upon reviewing the data from this study, it was found that the average wait time also varied across the United States. Washington state had one of the shortest waiting times at ~15 minutes, whereas West Virginia had one of the longest waiting times at ~21 minutes (Businesswire, 2017). Wait time proves to be an influential factor when it comes to patient satisfaction and clinician rating.

Physician care was also deemed as an influential factor in patient satisfaction. Multiple studies captured communication with patients as a key factor for satisfaction. An article addressed that physicians' verbal behaviors can have a positive association with patient satisfaction and clinician ratings (Beck, Daughtridge, Sloane, 2002). Listening to patients and communicating with patients in terms of assessment of care and consultation was also correlated with high patient satisfaction in one study (Gruß, Firemark, McMullen, Mayhew, Dabar, 2020). There are multiple factors that can influence patient satisfaction and clinician ratings, mainly communicating with patients and having a plan of care.

PAPER 1

Data Summary

Proposed Hypothesis:

1. H₁: There is a statistically significant difference between clinician rating in the Central and Southern regions.
H₀: There is no statistically significant difference between clinician rating in the Central and Southern regions.
2. H₁: There is a positive correlation between correct diagnosis and treatment utilization and clinician rating.
H₀: There is no correlation between correct diagnosis and treatment utilization and clinician rating.
3. H₁: There is a negative correlation between client satisfaction and the panel size of different districts.
H₀: There is no correlation between client satisfaction and the panel size of different districts.
4. H₁: There is a statistically significant difference between clinician rating and wait time explanation.
H₀: There is no statistically significant difference between clinician rating and wait time explanation.

Variables-

Dependent Variable:

- Clinician Rating

Independent Continuous Variables:

- % Female
- Average Age
- Total Panel Size
- % panel vst seen by PCP
- Panel - % Medicare
- PCP consult ratio
- Listen carefully to you?
- Explain understandably?
- Spend enough time w/ you?
- Respect what you said?
- Your best interests 1st?
- Info to diagnose/treat
- Knowledge of medical hx
- Helpful-clinical staff
- Courtesy/Respect-clinical
- Helpful-office staff
- Courtesy/Respect-office
- In exam room w/in 15 min
- Wait time explanation

Independent Categorical Variables:

- Clinic
- Division
- District
- Specialty
- Region

Explanation of Variables-

In this analysis, the dependent variable is the clinician rating (1-10). Clinician rating explains how the patient felt about the quality of care they received from their provider. The rating is based on several different independent variables. In this paper, the main focus was on the following variables: sample size (size of district), ability of clinician to explain better, and wait times. It is further interesting to see how certain variables had a bigger impact on ratings across different districts.

Sample Size Criteria-

The following guidelines were used to derive the final working data.

1. Physician panels that have 125+ patients
2. Physician panels that practice internal medicine and family medicine
3. Physician panels that have all categorical data present for clinic, division, district, specialty, and region data
4. Physician panels that have all data from the Patient Experience Survey provided by Group Health Cooperative

The guidelines are used to create the final working data. This resulted in a sample size of 196 physician panels. The panels are sorted by district below:

Health Care Center District (HCCD) - 30 Providers

Kitsap (KIT) - 19 Providers

King (KNG) - 36 Providers

Olympia (OLY) - 23 Providers

Seattle (SEA) - 54 Providers

Snohomish (SNOH) - 9 Providers

Tacoma (TAC) - 25 Providers

Total Sample Size :

Figure 1:

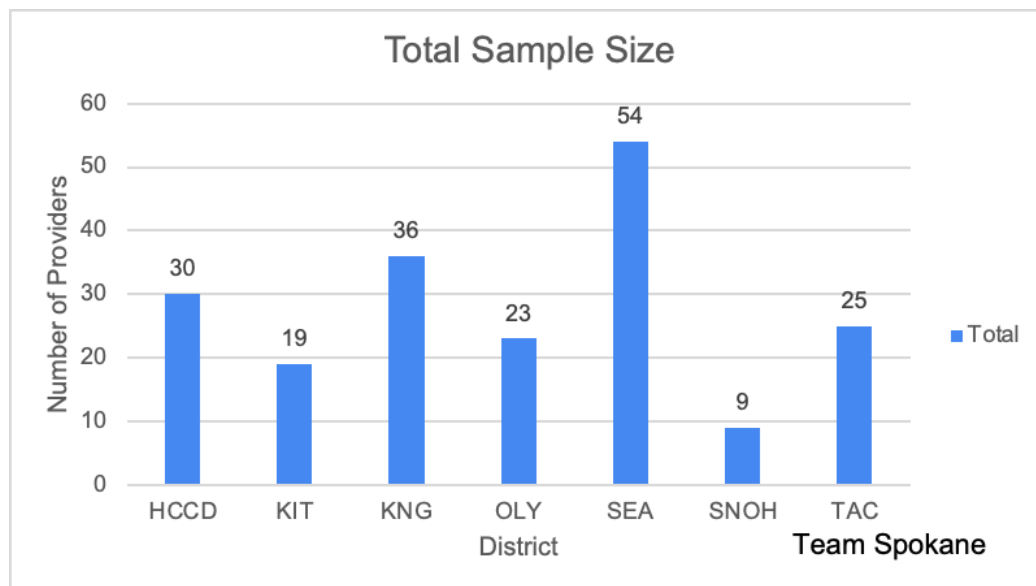


Figure 1. Total number of providers from each district that met sample size criteria. (Excel: Total Sample Size Histogram tab).

Descriptive Statistics :

Table 1:

<i>Clinician rating (0-10)</i>	
Mean	0.7833
Standard Error	0.0070
Median	0.8022
Mode	0.8750
Standard Deviation	0.0984
Sample Variance	0.0097
Kurtosis	0.6162
Skewness	-0.8972
Range	0.4879
Minimum	0.4483
Maximum	0.9362
Sum	153.5171
Count	196.0000
Confidence Level(95.0%)	0.0139

Table 1. Descriptive statistics of Clinician rating (0-10) for all districts combined (Excel: Descriptive Statistics tab).

Table 2:

<i>Clinician rating (0-10)</i>	HCCD	KIT	KNG	OLY	SEA	SNOH	TAC
Mean	0.8024	0.7833	0.7994	0.7450	0.8005	0.7707	0.7395
Standard Error	0.0143	0.0245	0.0153	0.0241	0.0122	0.0362	0.0216
Median	0.8117	0.8246	0.8250	0.7547	0.8235	0.7586	0.7586
Mode	0.8750	0.8750	0.8571	#N/A	0.7500	#N/A	#N/A
Standard Deviation	0.0783	0.1068	0.0919	0.1157	0.0894	0.1085	0.1079
Sample Variance	0.0061	0.0114	0.0084	0.0134	0.0080	0.0118	0.0116
Kurtosis	3.5838	1.8107	-0.7674	0.5698	-0.0386	-1.3022	0.3789
Skewness	-1.4375	-1.3438	-0.6184	-0.7278	-0.6679	0.0550	-0.9872
Range	0.3744	0.4040	0.3206	0.4777	0.3956	0.3204	0.4115
Minimum	0.5313	0.4889	0.6000	0.4483	0.5405	0.6111	0.4615
Maximum	0.9057	0.8929	0.9206	0.9259	0.9362	0.9315	0.8730
Sum	24.0714	14.8827	28.7772	17.1340	43.2277	6.9363	18.4879
Count	30.0000	19.0000	36.0000	23.0000	54.0000	9.0000	25.0000
Confidence Level(95.0%)	0.0292	0.0515	0.0311	0.0500	0.0244	0.0834	0.0445
Upper limit	0.8316	0.8348	0.8305	0.7950	0.8249	0.8541	0.7840
Lower Limit	0.7731	0.7318	0.7683	0.6949	0.7761	0.6873	0.6950

Table 2. Descriptive statistics of Clinician rating (0-10) for each district (Excel: Descriptive Statistics tab).

Table 1 gives the descriptive statistics for all districts combined Clinician rating (0-10). Table 2 gives the descriptive statistics for Clinician rating (0-10) for each individual district. While the differences between each mean are minor, there is clear variability across the district. It is easy to see that some district's physicians are outperforming others. Health Care Center District (HCCD) averages the highest clinician rating from patients and is .019 higher than the mean of all districts. The lowest clinician rating from patients belongs to Tacoma (Tac) with a mean .043 lower than the mean of all districts. This suggests that patients from HCCD think far more highly of their clinicians than TAC by a difference of .062. The districts do not vary much with standard deviation with all being .018-.2 away from the standard deviation. The kurtosis of all districts except HCCD are platykurtic suggesting that the data is far more distributed towards the tail with a score of >3 . Compared to a normal bell curve score of 3 which would mean it is normally distributed. HCCD value of 3.583 suggests that its data is distributed far more towards the mean and more narrow. It has less variation from the mean and is leptokurtic shaped. All districts except Snohomish have negative skewness suggesting all their data is skewed to the left. More statistical analysis is needed to further understand the variation amongst Clinician ratings.

Graphs -

Confidence Intervals :

Figure 2:

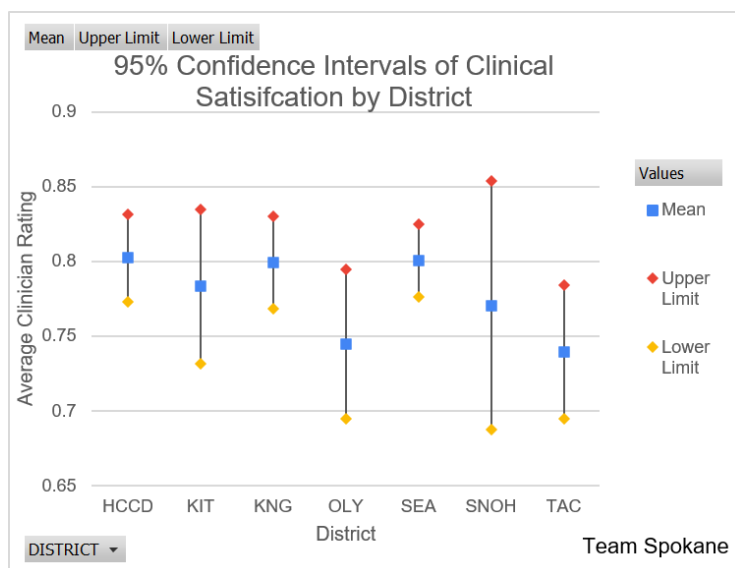


Figure 2. The average Clinical Satisfaction rating sorted by district. The blue square represents the mean for each district, the two diamonds represent the upper limit (red) and lower limit (yellow)(Excel: Descriptive Stats and Confidence Tab).

Figure 2. Presents the confidence intervals of the average Clinical Satisfaction rating sorted by district. The upper and lower limits were found using excel's descriptive statistics function and adding the 95% confidence value to the mean to find the upper limit and subtracting the 95% confidence value to the mean to find the lower limit for each district. There is little variation between each data point, to compensate the y-axis was adjusted to start at .65 and list in .05 increments to better show the intervals. 95% of all data points will lie between the upper and lower limits. The graph indicates that there is no statistically significant difference between the panel size of districts as all confidence intervals overlap meaning that there is not enough variance in the means.

Proposed Hypothesis Graphs -

Figure 3:

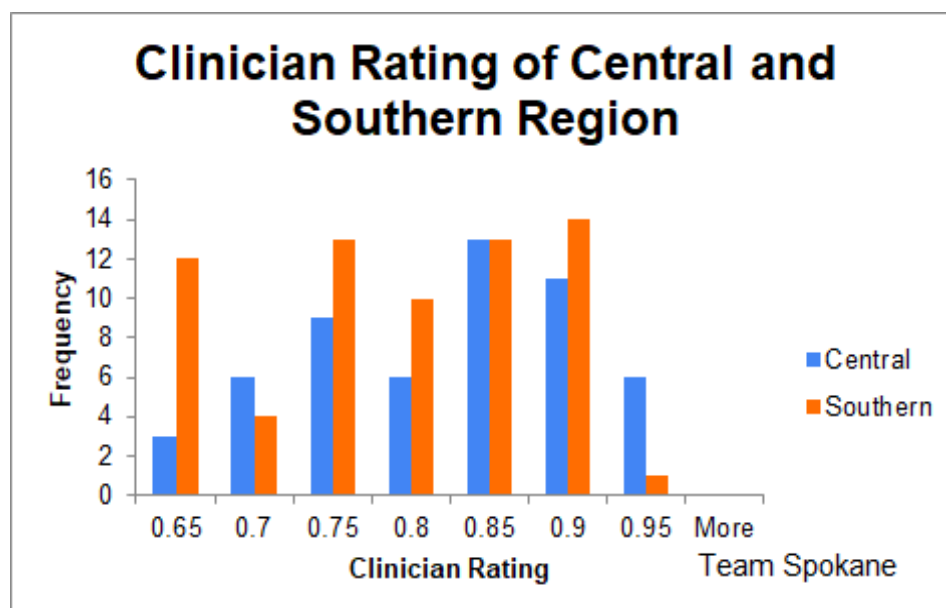


Figure 3. Histogram representing clinician rating and frequency between the Central and Southern Region. (Excel: Histogram Clinical Rating tab).

To see if there was a statistically significant difference between the two regions a t-test with equal variances was performed on excel(...). Equal variances were used because the difference between the two variances was less than 4. With a $p(T \leq t)$ of .007 the null hypothesis is rejected as it is less than .05. This suggests that there is enough evidence to reject the null hypothesis that there is no statistically significant difference between Central and Southern regions. More research would be needed to find if it is in fact statistically significant.

Figure 4:

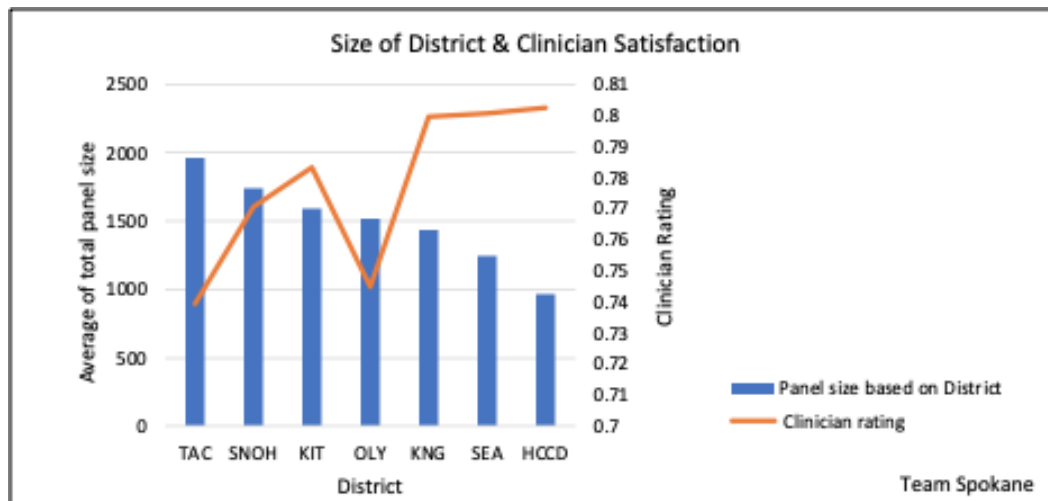


Figure 4. Shows the average clinician rating (0-10) and the average of total panel size across each district (Excel: District vs. clinician satisfaction).

There is a negative correlation between the rating of the clinician and the panel size under them across each district except for Olympia which does not follow the trend. The district Tacoma has the largest panel size and lowest rating while the district Health Care Center District has the smallest panel size and highest rating of their patients. This trend is also true for the other districts including Snohomish, Kitsap, King County and Seattle.

Figure 5:

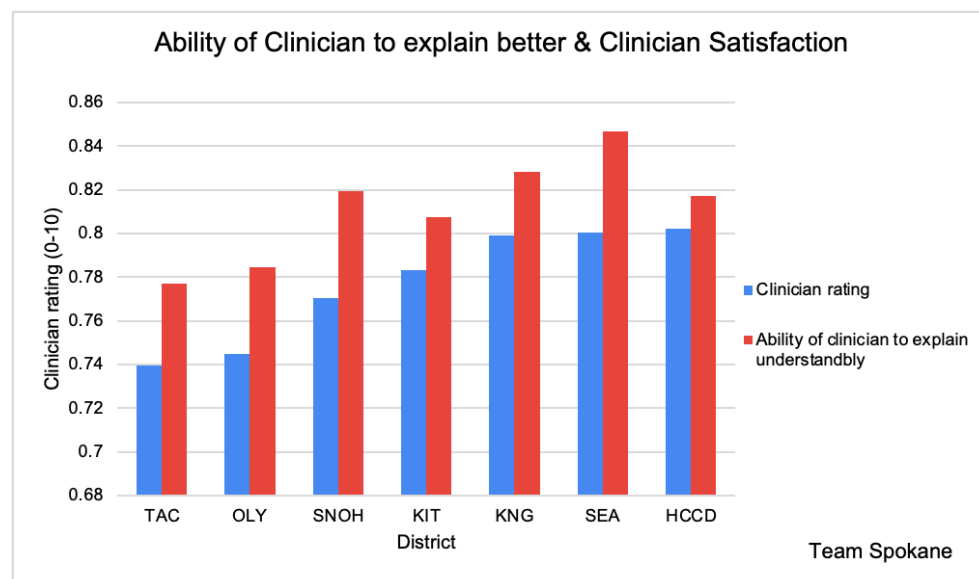


Figure 5. Shows the average Clinician rating (0-10) and the ability of clinicians to explain understandably to the patients across each district (Excel: Explain better vs rating tab).

There is a positive correlation between the rating of the clinician and the ability of clinicians to explain understandably to the patients. The districts Seattle, Health Care Center District, King, Snohomish, Health Care Center District have the highest rated clinicians by their patients which directly correlates with the higher rating of ability of the clinician to explain better.

Figure 6:

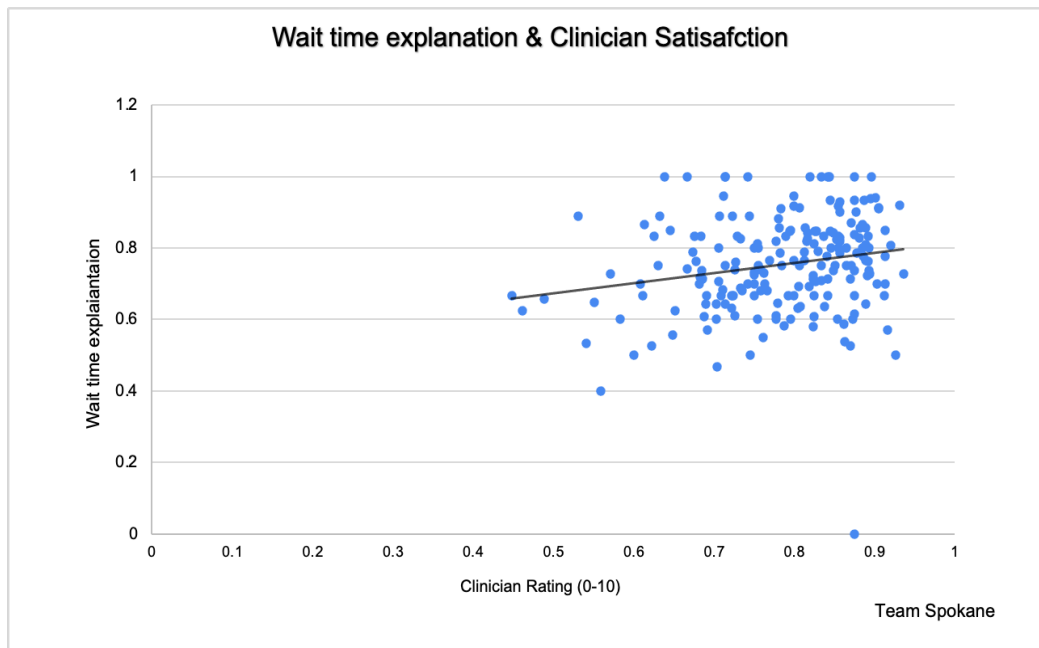


Figure 6. Displays a plot comparison between the average Clinician rating (0-10) by the patients and the wait time explanation provided by them. (Excel: Wait time vs rating).

There is a possibility of correlation between the two variables. To determine a statistically significant difference between the two regions a t-test with equal variances was performed on Excel(...). Equal variances were used because the difference between the two variances was less than 4. With a $p(T \leq t)$ of .006 the null hypothesis is rejected as it is less than .05. This suggests that there is enough evidence to reject the null hypothesis that there is no statistically significant difference between the average Clinician rating (0-10) and the wait time explanation provided by them. More research would be needed to find if it is in fact statistically significant.

Discussion

Patient satisfaction survey data results are significant diagnostic tools implemented to measure excellence at Group Health following providing care that is safe, effective, patient-centered, timely, efficient, and equitable. To accomplish excellence, this study was conducted to test the relationships among clinician rating in the Central and Southern regions, correct diagnosis and treatment utilization, client satisfaction and the panel size of districts, and clinician rating and wait time explanation. The subsequent analysis in the study showcased that the highest average patient clinician rating by district was in Health Care Center District while the lowest was in Tacoma. There is no statistically significant difference between clinician satisfaction and district. Therefore, the null hypothesis on the relationship between Central and Southern regions was rejected as there is no statistically significant difference among the Central and Southern regions. The study uncovered the district of Tacoma to house the largest panel size and the lowest clinician rating, while on the other hand, the Health Care Center District housed the smallest panel size and the highest clinician rating. Demonstrating that there is a negative correlation between clinician rating and panel size as a smaller panel size is favorable for scoring higher clinician ratings.

Moreover, as the top ranked clinician district, Health Care Center District also ranked high for the ability of the clinician to explain better during the patient care encounter. Likewise, the districts Seattle, King, and Snohomish scored the highest rated clinicians by their patients directly relating to scoring higher on the ability of the clinician to explain better during the visit. As there is a positive correlation among the rating of the clinician and the ability of clinicians to explain understandably to their patients. Supporting the foundations of clinical performance principle that when explanations during the patient care experience are present, Group Health is able to ensure accurate diagnoses, excellence, and individualized patient care. Furthermore, while wait time is an important patient satisfaction item, the wait time explanation did not prove to alter clinician rating as the null hypothesis was rejected and there was no statistically significant difference between the average clinician rating and the wait time explanation. Altogether, the analysis demonstrated actionable items to achieve favorable clinician rating scores, and further analysis can be used to explore further variables that contribute to achieving higher clinician ratings. The ultimate goal of Group Health being to achieve improvements in excellence, individualized patient care, clinical performance, and community/population health.

Conclusion

Clinician satisfaction ratings are prime indicators of the care visit experience from the patient's perspective. Clinicians with the highest ratings generally have a smaller number of individual patients under their care and possess the ability to communicate the care plan effectively during the patient visit. These providers with fewer patients to treat are timely and explanatory to the patients that they do treat. The patients who are treated by these providers are more likely to return for care and recommend their clinician.

PAPER 2

Patient Satisfaction with Clinician at GroupHealth Findings in Paper 1:

In paper one, clinician satisfaction ratings represent how well a clinician has performed based on the clinician's average rating among their patients. It is a useful indicator to determine what one region or dependent variable is doing that allows the clinician to be able to stand out among their peers. To determine what variable or region's clinicians are doing differently we used graphs to find correlations. A few correlations were found. A negative correlation between clinician rating and panel size as a smaller panel size is favorable for scoring higher clinician ratings. A positive correlation among the rating of the clinician and the ability of clinicians to explain understandably to their patients was also found. The top ranked clinician ratings district also had the highest rated ability to explain.

Patient Satisfaction with Clinician at GroupHealth Outlook for Paper 2:

To build on paper one, we plan on performing statistical analysis and testing on regions to find differences among the samples to determine which areas are truly performing better. In paper one, we inappropriately used statistical testing that we aim to improve on in paper two. Specifically, the sample's mean, variance, and median differences among clinics, districts, and regions. As well as, using standard error, confidence intervals and graphs to conclude on the differences in means and associations among clinician rating.

Data Summary Extension

Additional Proposed Hypotheses:

1. H_1 : There is a statistically significant difference between mean clinician rating in the South region and Network region.
 H_0 : There is no statistically significant difference between mean clinician rating in the South region and Network region.
2. H_1 : There is a statistically significant difference between the variance of distribution in the districts of Olympia and Northgate.
 H_0 : There is no statistically significant difference between the variance of distribution in the districts of Olympia and Northgate
3. H_1 : There is a statistically significant difference in the mean between clinician rating in the districts of Olympia and Northgate.
 H_0 : There is no statistically significant difference in the mean between clinician rating in the districts of Olympia and Northgate
4. H_1 : There is a statistically significant difference between mean clinician rating within OLY, NGT, RFM and FHC clinics.
 H_0 : There is no statistically significant difference between mean clinician rating within OLY, NGT, RFM and FHC clinics.
5. H_1 : There is a statistically significant difference between clinician rating medians within BRN and EVM clinics.
 H_0 : There is no statistically significant difference between median clinician rating within BRN and EVM clinics.
6. H_1 : There is a statistically significant difference in median clinician ratings between BRN, CDA, and EVM clinics.
 H_0 : There is no statistically significant difference in median clinician ratings between BRN, CDA, and EVM clinics.
7. H_1 : There is an association between clinician satisfaction and the districts at GHP.
 H_0 : There is no association between clinician satisfaction and the districts at GHP.

Sample Size Per Test Statistic:

- z-test: 2 regions
- f-test: 2 districts
- t-test: 2 districts
- ANOVA + Tukey test: 4 clinics
- Mann-Whitney: 2 clinics
- Kruskal Wallace: 3 clinics

Statistics -

Standard Error :

Table 3:

Region	Standard Deviation	Sqrt(Count of Sample set)	Standard Error
SO	0.1150	7.3484	0.0156
NTWK	0.0854	4.1231	0.0207

Table 3. Standard Error for South and Network regions. (Excel: Standard Error-Descriptive Statistics).

Table 3. Displays the Standard error calculated for Clinician rating (0-10) in two regions- South and Network. Standard Error is the difference between the population mean and the sample mean and is used to create confidence intervals around the two regions for a visual representation. Here the population mean of Clinician rating in all the regions is 0.7832. The sample mean for the South region is 0.7519 and the sample mean for the Network region is 0.8058. To find out the standard error, standard deviation of the South and Network region was divided by square root of the count of their sample set respectively. Using this formula, the standard error for the SO region was calculated as 0.0156 and for the NTWK region the standard error was 0.0207. The regions SO and NTWK were chosen because of their similar sample size of more than 25 people.

Table 4:

<i>Clinician rating</i>	<i>SO</i>	<i>NTWK</i>
Mean	0.7519	0.8058
Standard Error	0.0135	0.0143
Median	0.7617	0.8163
Mode	0.7142	0.875
Standard Deviation	0.1100	0.0773
Sample Variance	0.0121	0.0059
Kurtosis	0.3890	4.4266
Skewness	-0.8923	-1.6095
Range	0.4776	0.3744
Minimum	0.4482	0.5312
Maximum	0.9259	0.9056
Sum	49.6295	23.3687
Count	66	29
Confidence Level(95.0%)	0.0270	0.0294
Upper Limit	0.8620	0.8831
Lower Limit	0.6418	0.7284

Table 4. Displays descriptive statistics for clinician rating (0-10) in two regions - South and Network. (Excel: Standard Error-Descriptive Statistics).

Confidence Interval :

Figure 7:

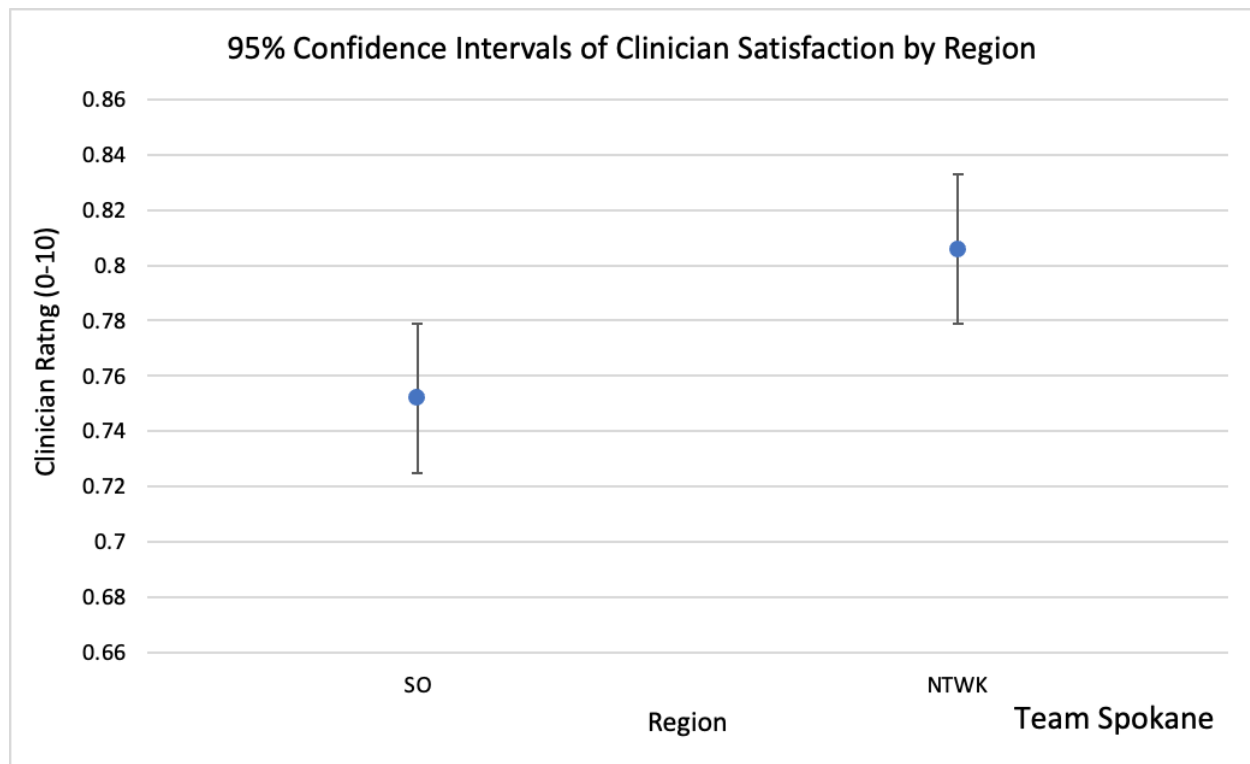


Figure 7. Confidence Interval for South and Network regions. (Excel: Confidence Interval).

Figure 7. displays confidence intervals calculated for the clinician rating(0-10) in two regions-South and Network using the descriptive statistics seen in Table 4. The confidence level for the SO Region was +/- 0.0270 while the confidence level for the NTWK Region district was +/-0.0294 (See Excel: Confidence Interval). Figure 4 for confidence intervals displays that the mean for clinician rating in SO region, falls between 0.6418 and 0.8620, while the mean for clinician rating in NTWK region falls between 0.8831 and 0.7284.

Z-Test:

Hypothesis -

H_1 : There is a statistically significant difference between mean clinician rating in the South region and Network region.

H_0 : There is no statistically significant difference between mean clinician rating in the South region and Network region.

Table 5:

z-Test: Two Sample for Means		
	South	Network
Mean	0.7520	0.8058
Known Variance	0.0122	0.0061
Observations	66	29
Hypothesized Mean Difference	0	
z	-2.7076	
P(Z<=z) one-tail	0.0034	
z Critical one-tail	1.6449	
P(Z<=z) two-tail	0.0068	
z Critical two-tail	1.9600	

Table 5. Means for South and Network regions. (Excel: Region Z-test).

Figure 8:

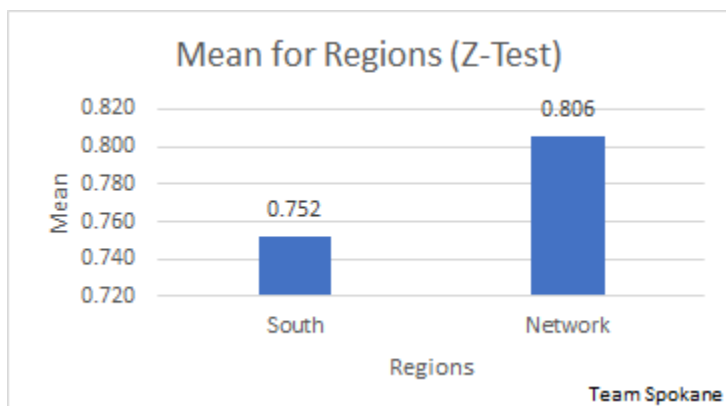


Figure 8. Bar graph on differences in means for the South and Network regions. (Excel: Region Z-Test & Graphs).

Figure 9:

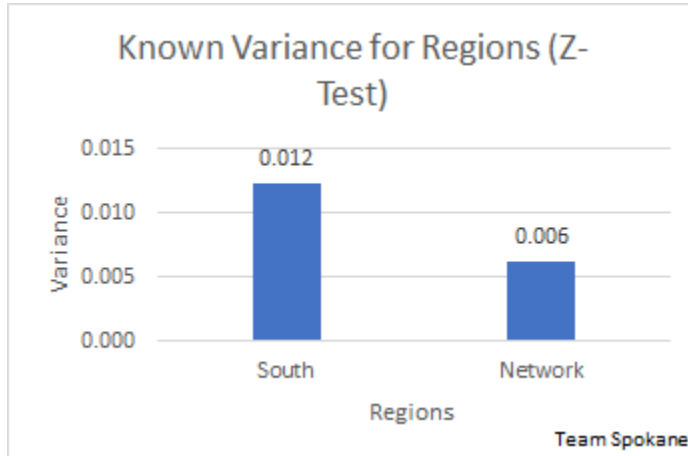


Figure 9. Bar graph on the variance difference between South and Network region on the Z-test. (Excel: Region Z-Test & Graphs).

A Z-test was performed on South and Network regions to see if there is a statistically significant difference between the two. The regions were chosen because they are the lowest and highest performing in clinician satisfaction. Descriptive statistics was done to determine the variances. The critical value is 1.96 while the statistical test absolute value is 2.7076. The $P = 0.05$ to compare and the statistic number for $P < .05$. With the statistical test value being above the critical value and the P values being below .05, we are able to reject the null hypothesis that there is no difference in mean clinician satisfaction between South and Network regions.

F-Test :

Hypothesis -

H_1 : There is a statistically significant difference between the variance of distribution in the districts of Olympia and Northgate.

H_0 : There is no statistically significant difference between the variance of distribution in the districts of Olympia and Northgate.

Table 6:

F-Test Two-Sample for Variances		
	OLY	NGT
Mean	0.7450	0.7525
Variance	0.0134	0.0067
Observations	23	18
df	22	17
F	2.0063	
P(F<=f) one-tail	0.0735	
F Critical one-tail	2.2084	

Table 6. F-test variances for districts Olympia and Northgate. (Excel: Clinic F and T Tests).

Figure 10:

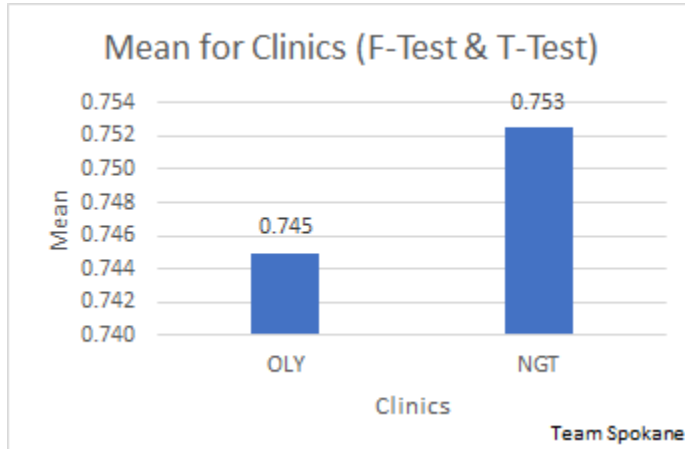


Figure 10. Bar graph on the differences in means for OLY and NGT clinics on the F-Test and T-Test. (Excel: Clinic F and T Tests & Graphs).

Figure 11:

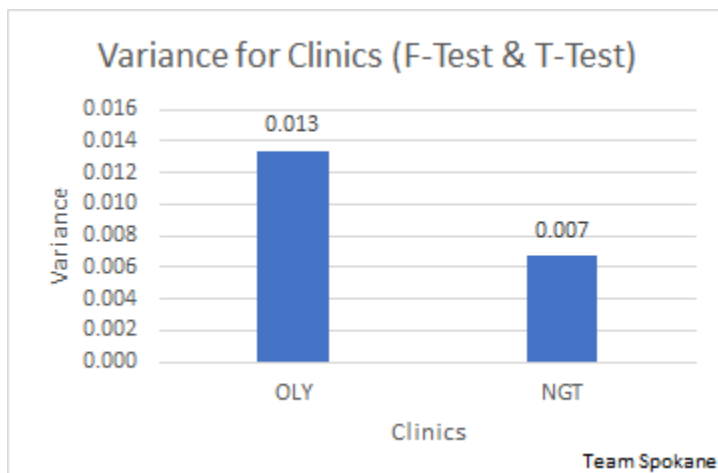


Figure 11. Bar graph on the difference in variance between OLY and NGT clinics on the F-test and T-test. (Excel: Clinic F and T Tests & Graphs).

An F-test was done to determine if variances between Olympia and Northgate had equal distribution. Districts Olympia and Northgate have 10-25 observations which is what is needed for t and f tests. If the variances are equal, it allows us to identify which t-test is needed for additional analysis. f-test results are $p > .05$ and the statistical test is 2.006 which is less than the critical value of 2.208. This means we must accept the null because there is no statistical difference between Olympia and Northgate.

T-Test :

Hypothesis -

H_1 : There is a statistically significant difference in the mean between clinician rating in the districts of Olympia and Northgate.

H_0 : There is no statistically significant difference in the mean between clinician rating in the districts of Olympia and Northgate.

Table 7:

t-Test: Two-Sample Assuming Equal Variances		
	OLY	NGT
Mean	0.7450	0.7525
Variance	0.0134	0.0067
Observations	23	18
Pooled Variance	0.0105	
Hypothesized Mean	0	
df	39	
t Stat	-0.2352	
P(T<=t) one-tail	0.4076	
t Critical one-tail	1.6849	
P(T<=t) two-tail	0.8153	
t Critical two-tail	2.0227	

Table 7. T-test variances for districts Olympia and Northgate. (Excel: Clinic F and T Tests).

T-tests are done after you have completed the F-test showing that the variances are equal and cannot reject the null. The statistical f value is 0.2352 (absolute value) while critical value is 2.023 and the $P > 0.05$. Which means we cannot reject the null, showing there is no statistical difference between Olympia and Northgate.

ANOVA :

Hypothesis -

H_1 : There is a statistically significant difference between mean clinician rating within OLY, NGT, RFM and FHC clinics.

H_0 : There is no statistically significant difference between mean clinician rating within OLY, NGT, RFM and FHC clinics.

Table 8:

Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
Capital Hill	20	16.86	0.843	0.005		
Riverfront	11	8.899	0.809	0.003		
Northgate	18	13.55	0.753	0.007		
Olympia	23	17.13	0.745	0.013		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.1291	3	0.0430	5.411	0.0021	2.740
Within Groups	0.5410	68	0.0080			

Table 8. ANOVA test for districts Capital Hill, Riverfront, Northgate, and Olympia. (Excel: ANOVA and Tukey Tests).

Figure 12:

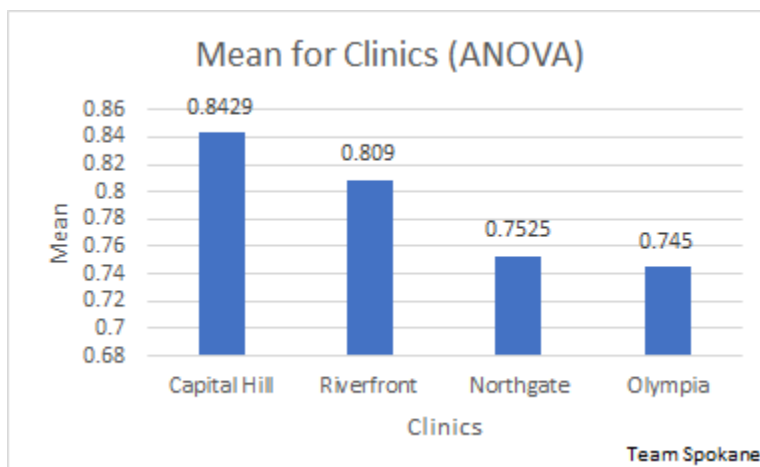


Figure 12. Bar graph on differences in means for Capital Hill, Riverfront, Northgate, and Olympia clinics on the ANOVA test. (Excel: ANOVA and Tukey Tests & Graphs).

Figure 13:

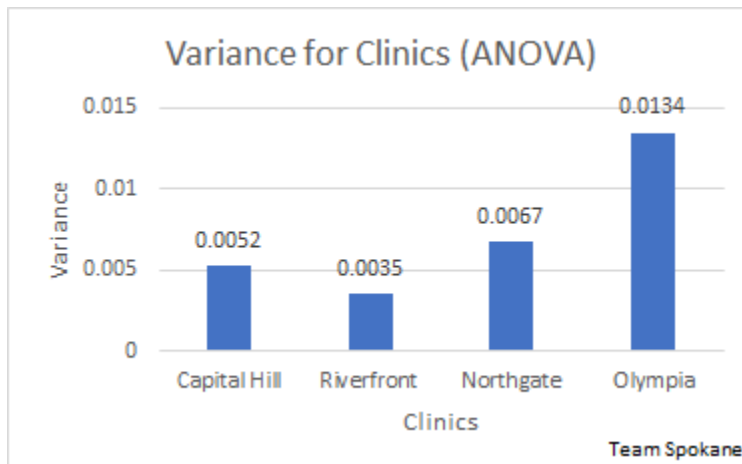


Figure 13. Bar graph on the difference in variance between Capital Hill, Riverfront, Northgate, and Olympia clinics on the ANOVA test. (Excel: ANOVA and Tukey Tests & Graphs).

An ANOVA was performed to see the ratio between and within group variation with Capital Hill, Riverfront, Northgate, and Olympia clinics. The statistical F value is 5.41, which is higher than the critical value of 2.739 and the P value is 0.0021 which is less than 0.05, which shows that we can reject the null that there is no difference in mean level clinician satisfaction across these 4 clinics. A Tuckey test must be performed to see where the variation is.

Tukey Test :

Hypothesis -

H_1 : There is a statistically significant difference between mean clinician rating within OLY, NGT, RFM and FHC clinics.

H_0 : There is no statistically significant difference between mean clinician rating within OLY, NGT, RFM and FHC clinics.

Table 9:

within groups dof		68			
groups		4			
Q, 4,68, .05		3.74			
harmonic mean		16.67			
critical value at .05		0.0817			
		Capital Hi	Rivefront	Northgate	Olympia
		0.7450	0.7525	0.8090	0.8429
Capital Hill	0.7450		0.0076	0.0640	0.0980
Rivefront	0.7525			0.0564	0.0904
Northgate	0.8090				0.0340
Olympia	0.8429				

Table 9. Tukey test for districts Capital Hill, Riverfront, Northgate, and Olympia. (Excel: ANOVA and Tuckey Tests).

A Tukey test was performed because there was a statistical difference between clinics calculated from the ANOVA test. Moving forward the Tukey test will allow us to see where that difference is. First, the harmonic mean (16.67) must be calculated and degrees of freedom (68) and number of groups (4) to obtain Q-value (3.74) on the Tukey table must be found. From these numbers our critical value was calculated, 0.0817. After calculating the means of the groups, a pairwise comparison was performed to see where the differences are, which are between Olympia and Capital Hill, as well as between Olympia and Riverfront. With these results we can reject the null which states there is no significant difference between the four clinics.

Mann-Whitney :

Hypothesis -

H_1 : There is a statistically significant difference between clinician rating medians within BRN and EVM clinics.

H_0 : There is no statistically significant difference between median clinician rating within BRN and EVM clinics.

Table 10:

Clinic	Clinician Rating	Rank	SUM SNOH	50 r1
BRN	0.8750	4	Sum KIT	86 r2
BRN	0.8276	7	Count SNOH	7 n1
BRN	0.9123	2	Count KIT	9 n2
BRN	0.8125	10		
BRN	0.8889	3		
BRN	0.5405	16	$u1=n1*n2+n2(n2+1)/2-r2$	
BRN	0.8235	8	$u2=n1*n2+n1(n1+1)/2-r1$	
EVM	0.8200	9		
EVM	0.6923	13		
EVM	0.6111	15	u1	22
EVM	0.8714	5	u2	41
EVM	0.9315	1		
EVM	0.6667	14		
EVM	0.7586	11		
EVM	0.8704	6		
EVM	0.7143	12	22> 5	

Table 10. Mann-Whitney for clinics BRN and EVM. (Excel: Clinic Mann-Whitney).

Mann-Whitney was performed to test the difference between medians of clinics BRN and EVM. Using a Mann Whitney $\alpha=0.05$, in our case we have 7 and 9 observations which yields a critical statistic of 5. Since our U value is larger than the critical statistic, we can not reject the null hypothesis.

Discussion:

Previously, graphs were used to determine correlations among patient satisfaction between different variables and regions to make observations. This paper aimed to develop further understanding among the relationships between regions, districts, and clinics by utilizing various forms of statistical testing. The first hypothesis was tested with a z-test comparing the means of South and Network regions to find a difference between the lowest and highest rated clinician regions. With a z-score higher than the critical value we were able to reject the null hypothesis. This suggests that there is enough evidence to conclude that there is a difference between the means of the two regions. Next, we began testing differences at the district level beginning with a chi-square test. The test was used to determine if the Group Health Cooperative clinician data among the districts is accurately represented. We were able to reject the null hypothesis that there is no association between clinician data and the districts. By knowing that the district level clinician data is accurately represented we looked for differences between the districts. A f-test was done to determine a difference in variance among the districts of Olympia and Northgate. The f-test assumes there is a normal distribution among the two samples and not enough evidence was found to reject the null hypothesis therefore we must accept the claim that there is no difference between the variance of the two districts. We aimed to further understand the relationship between the districts Olympia and Northgate as their variances were determined to not have a difference, so a t-test assuming equal variances was done to determine if there is a difference between the means of the two regions. As with the two region's variance, the means of both regions were determined to not have a difference in their mean. After drawing different conclusions at the region and district level we conducted an ANOVA test to determine differences in means at the clinic level. Capital Hill, Riverfront, Northgate, and Olympia clinics were used, and we were able to reject the null hypothesis, but we needed to find where the difference in means was located as the ANOVA test only finds the difference and not where the difference in means is. A Tukey test was performed to determine where the difference in clinics' means lied. The differences were found between Olympia and both Capital Hill and Riverfront. To further build on our findings at the clinic level we used non-parametric testing with the Mann-Whitney test and Kruskal-Wallis test. Through the Mann-Whitney test we were unable to find differences between clinical rating medians within the BRN and EVM clinics. The Kruskal-Wallis test was used to build on the previous findings, and we were unable to reject the null hypothesis that there was a difference between the clinics' medians.

Final Conclusion:

Clinician satisfaction ratings are prime indicators of the care visit experience from the patient's perspective. Clinicians with the highest ratings and lowest ratings need to be further studied on what separates them from other Clinicians to bring other areas up to a higher standard. This paper found differences at the region and clinic level suggesting that there is something causing

one area to perform better than another. Further research must be done to determine what that is. More research must be done at the district level to determine if there is a difference at that level.

PAPER 3:

Patient Satisfaction with Clinician at GroupHealth Findings in Paper 2:

Paper two aimed to develop understanding among the relationships between regions, districts, and clinics by utilizing various forms of statistical testing. A z-test was conducted, comparing the means of South and Network regions to find any differences between the lowest and highest rated clinician regions. A chi square test was conducted to determine if the Group Health Cooperative clinician data among the districts is accurately represented. A f-test was conducted to determine a difference in variance among the districts of Olympia and Northgate. To further understand the relationship between the districts Olympia and Northgate as their variances were determined to not have a difference, a t-test assuming equal variances was done to determine if there is a difference between the means of the two regions. An ANOVA test to determine differences in means at the clinic level. A Tukey test was performed to determine where the difference in clinics' means lied. To further build on our findings at the clinic level, we conducted a non-parametric test with the Mann-Whitney test and Kruskal-Wallis.

Patient Satisfaction with Clinician at GroupHealth Outlook for Paper 3:

For paper 3, a correlational analysis will be conducted between clinician rating and “explain understandably” survey response. Simple regressions will be conducted between clinician rating and “explain understandable”. Multiple regressions will be performed to explain the relationships between clinician rating and independent variables. A nominal regression will be performed to determine if the location affects the explanatory power of the model. Dynamic charts and tableau charts will be used to show relations with independent variables and clinician rating.

Correlation Analysis:

H_1 : There is a statistically significant relationship between Clinician Rating and Explain Understandably?

H_0 : There is not a statistically significant relationship between Clinician Rating and Explain Understandably?

Figure 14:

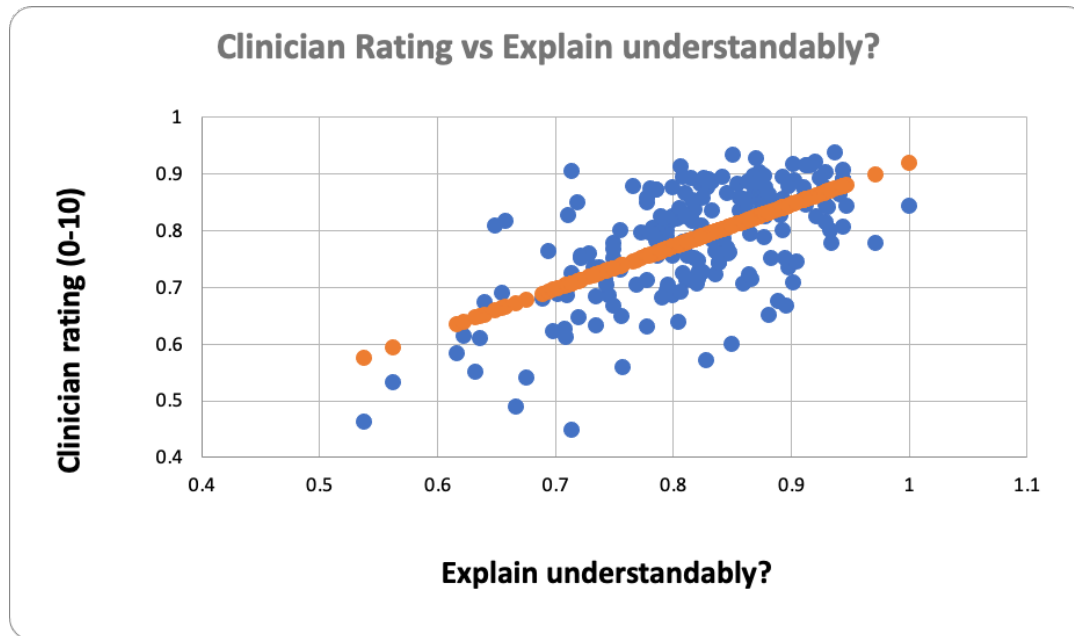


Figure 14. Scatter Plot comparison of Clinical Rating and Explain Understandably? (Excel: Correlation tab)

Figure 14. displays a scatterplot comparison between “Explain Understandably” and Clinician Rating (0-10). To test statistical significance, an R-squared test was conducted that displays the correlational strength between the two variables. A further correlation analysis was done to understand the significance of this correlation.

Table 13:

	Clinician rating (0-10)	Explain understandably?
Clinician rating (0-10)	1	
Explain understandably?	0.6126	1

Using Correl	0.6126
Correlation squared	0.3753
Standard error	0.0400
t statistic	15.3059
p value	9.48041E-42

Table 13. Relationship between Clinician Rating and Explain Understandably to you (See Excel: Correlation tab)

The correlational analysis was run to test the relationship between clinician rating and Explain Understandably to you. A critical value of $p = 0.05$ was established. The correlation coefficient squared value was 0.3753, with a standard error of 0.04. $P < 0.05$ means that we can reject the null hypothesis that there is no relationship between clinician rating and Explain Understandably to you, meaning that there is a significant relationship. (See Excel: Correlation tab)

Simple Regression:

H_1 : There is a statistically significant relationship between Clinician Rating and Explain Understandably to you?

H_0 : There is not a statistically significant relationship between Clinician Rating and Explain Understandably to you?

Significance of independent variable:

The independent variable - Explain Understandably to you? was chosen to run a simple regression analysis with the dependent variable - Clinician Rating (1-10) because the ability of the clinician to explain better to their patients might lead to a better clinician rating, meaning there can be a positive correlation between the two variables. To check if there is a statistically

significant relationship between Clinician Rating and Explain Understandably to you? A simple regression analysis was performed.

Figure 15:

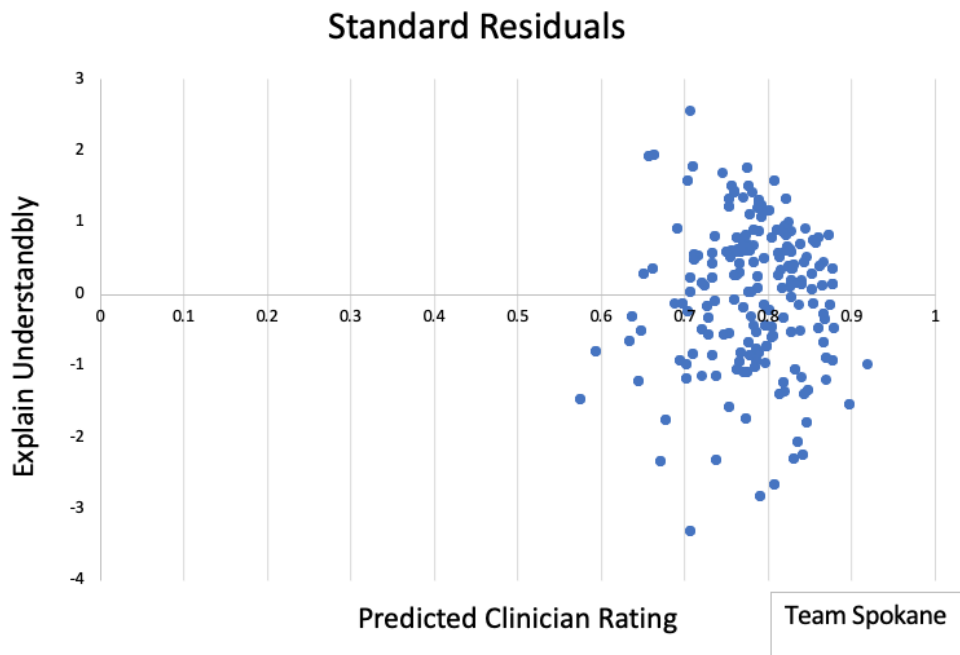


Figure 15. Scatterplot comparison of Standard Residuals and Predicted Clinician Rating (See Excel: Simple Regression tab)

Figure 15. (see Correlation Analysis) shows that Explain Understandably to you? and Clinician Rating (0-10) are associated to some degree. The R-squared analysis produced a value of 0.3753. A further regression test was conducted to analyze the statistical significance of this relationship. (See Excel: Simple Regression). Figure . shows that there is a good relationship between the standard and predicted data points meaning that the line represented in Figure. is an accurate representation of the data.

Table 14:

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.1750	0.0566	3.0920	0.0023	0.0634	0.2867
Explain understandably?	0.7438	0.0689	10.7951	1.41E-21	0.6079	0.8797

Table 14. Simple Regression relationship between Explain Understandably to you? and Clinician Rating (See Excel: Simple Regression tab)

Table 14. shows that the p-value for the simple regression for Explain Understandably to you? and Clinician Rating (0-10) at 0.00 which is less than the chosen alpha of 0.05. This means that the null hypothesis can be rejected, meaning that there is a statistically significant relationship between Explain Understandably to you? and Clinician Rating (0-10). This relationship shows us that patients really value their provider taking the time to understandably explain to them and that it is one of the top factors that contributes to a clinician getting high ratings. This information can be used in provider training and education activities to help clinicians learn to explain understandably so they can make sure that their patients understand their clinicians and their diagnosis better.

Correlational and Regression analyses continued to determine which variables were truly related to clinician rating and patient satisfaction. Correlational analyses hinted at a relationship between the “Listen Carefully” survey response and clinician rating, which was confirmed through regression analysis. Regression analysis also determined that Knowledge of Medical History and % PCP Schedule for Panel have a strong correlation to clinician rating.

Multiple Regressions

In the multiple regression modeling section, you will need to summarize the partial F-test results as you develop your final model. For your final model, you will need to discuss your regression results, the resulting ANOVA, and the significance of the independent variables.

Table 15:

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.0434	0.0853	0.5086	0.6116	-0.1249	0.2116
Explain understandably?	0.3897	0.0716	5.4394	1.64986E-07	0.2484	0.5310
Knowledge of medical hx	0.5013	0.0608	8.2456	2.78018E-14	0.3814	0.6213
Helpful-office staff	0.0359	0.0702	0.5108	0.6101	-0.1026	0.1743
Panel - % Medicare	0.0679	0.0661	1.0274	0.3056	-0.0624	0.1982
% Female	0.0403	0.0302	1.3366	0.1830	-0.0192	0.0999
% panel vst seen by PCP	-0.0256	0.0508	-0.5035	0.6152	-0.1258	0.0746
% PCP schedule for panel	0.0027	0.0288	0.0944	0.9249	-0.0541	0.0595

Table 15. shows the initial correlation pulled from the overall correlation of all variables between Clinician rating (0-10) and the following variables: Explain understandably?, Knowledge of medical hx, Helpful-office staff, Panel - % Medicare, % Female, % panel vst seen by PCP, %PCP schedule for panel. To improve the model, a stepwise regression approach was used to remove all P-values greater than .05 to reduce intercorrelation between variables starting with the highest p value. After each regression, a partial f-test was performed to ensure no decrease in the power of the explanatory model occurred.

The first variable to be removed was % PCP schedule for panel with a P-value of .9249 and resulted in a partial f test score of .9249 confirming the removal would not decrease the explanatory power of the model. The next variable to be removed was Helpful-office staff with a P-value and partial f test score of .6129. Next, % panel vst seen by pcp was removed with a P-value and partial f test score of .5418. Panel - % Medicare was then removed which resulted in a P-value and partial f test score of .3688. Lastly, % Female was removed with a P-value and partial f test score of .1940 confirming that there was no decrease in the explanatory model. After the removal of these four variables the final model was created.

Table 16:

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.0808	0.0484	1.6711	0.0963	-0.0146	0.1762
Explain understandably?	0.4076	0.0681	5.9828	0.0000	0.2732	0.5419
Knowledge of medical hx	0.4967	0.0538	9.2256	0.0000	0.3905	0.6029

Table 16. The stepwise regression approach resulted with the final model of Clinician Rating = $.0808 + .4076 \times \text{Explain understandably?} + .4967 \times \text{Knowledge of medical hx}$. All of the final variables have a positive correlation with Clinician rating (0-10). Meaning as each of these independent variables increases in value so will Clinician rating (0-10).

Table 17:

<i>Regression Statistics</i>	
Multiple R	0.7526
R Square	0.5665
Adjusted R Square	0.5620
Standard Error	0.0651
Observations	196

Table 18:

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	2	1.0703	0.5352	126.0859	9.405E-36
Residual	193	0.8192	0.0042		
Total	195	1.8895			

Table 18

Table 17 and 18 show the final model's regression and ANOVA analysis. With an R square value of .5665, this model is able to explain 56.65% of the variance between Clinician rating (0-10) and independent variables. The ANOVA analysis resulted in a value of 126.0859 which is greater than the critical value of 3.63. This means that we can reject the null hypothesis that there is no significant difference between the model's variables.

Nominal data

H_1 : There is a decrease in the explanatory power of the model through location

H_0 : There is no decrease in the explanatory power of the model through location

Table 19:

Partial F-test	1.653		
Deg. Of Freed.	6		
	187		
P-Value	0.1348		
p>.05 so we cannot reject the null that there is no decrease in explanatory power of the model.			

Table 19. Nominal Regression Statistical calculation showing the significance of location in explanatory power (See Excel: Nominal Regression)

Table shows the p-value of 0.1348 for the significance of location in explanatory power. The p-value is more than .05 so we cannot reject the null hypothesis that there is no decrease in the explanatory power of the model through location.

3 Scenarios

Table 20:

Scenario Summary			
	Current Values:	Average	Slight Change
Changing Cells:			
scn.explain.understandably	0.8571	0.8176	0.8571
scn.knowledge.of.med.hx	0.7553	0.7432	0.7553
Result Cells:			
scn.Clinicain.rating	0.8053	0.7832	0.8053

Notes: Current Values column represents values of changing cells at time Scenario Summary Report was created. Changing cells for each scenario are highlighted in gray.

Table 20. Scenario Summary calculation showing the different scenarios

Table 20 is the averages of all the variables and if they are correlated to each other. The average was taken first to get an overall view of the region and their results within the variables selected. Next, slight changes were made to the variables to see if it made a difference in the overall clinician rating. Adjusting the variable results in different clinician ratings, higher percentiles produce higher ratings.

Optimization Model

Figure 16:

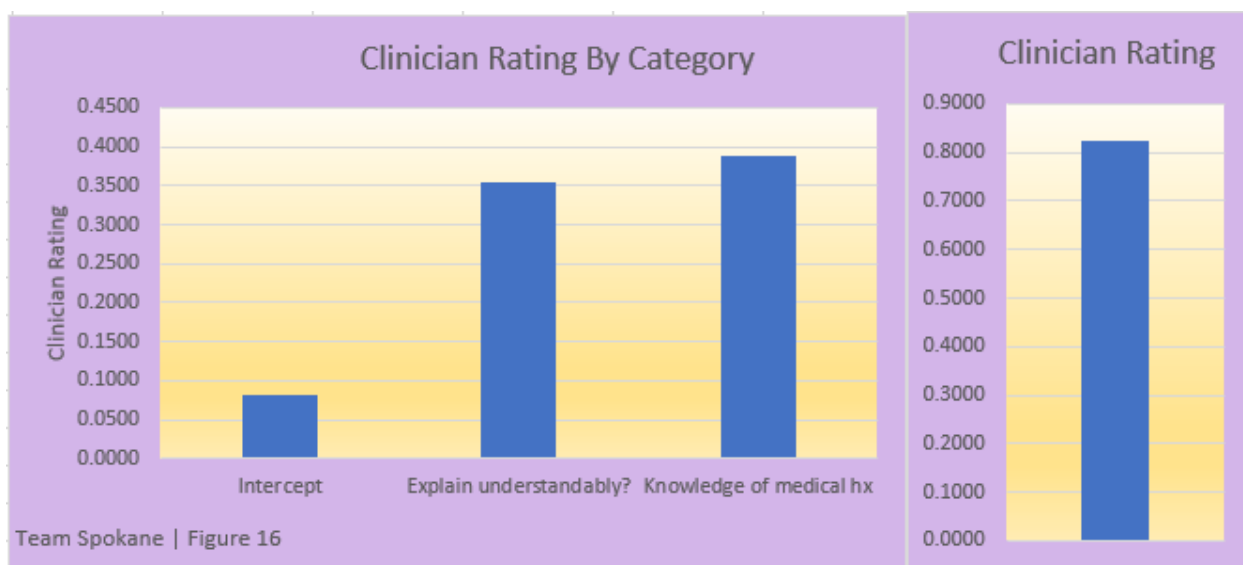


Figure 16. Clinician Rating by Scenario (See: Excel Optimization)

Figure 16 shows a graph using an optimization model. This allows you to see the range percentiles for each variable as well as comparison of how certain other variables correlate to the clinician rating by moving the data around.

Dynamic Chart

Figure 17:

Scenarios					
Explain understandably?	30th Percentile				0.7890
Knowledge of medical hx	30th Percentile				0.6992
The scenario's new Clinician Satisfaction					0.7497

Figure 17. Dynamic Chart of scenarios

Figure 17 shows a visualization of the comparison between Clinician rating and 2 other different measures (“Explain understandably?” and “Knowledge of medical hx”). The dropdown menu and the slider allows readers to manipulate the data to show various outcomes.

Tableau Dashboard

Figure 18:

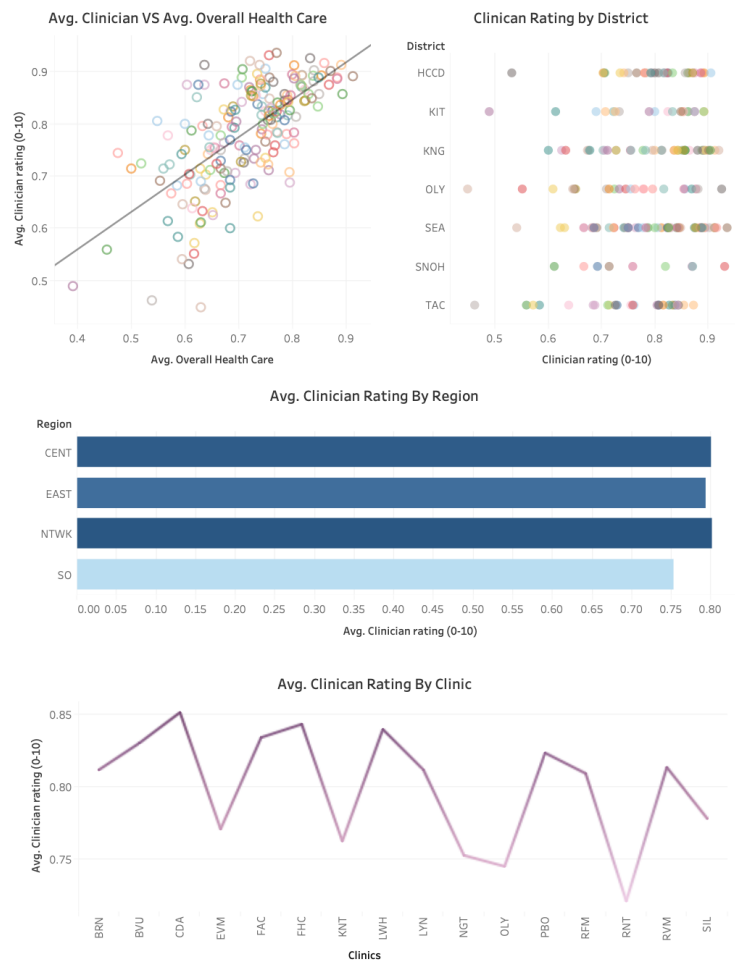


Figure 18. Dashboard of Clinician Satisfaction compared to other variables.

Figure 18 displays a dashboard of Clinician Ratings in comparison to other data: Overall Health Care, District, Region, and Clinic. The dashboard allows readers to view multiple visuals at the same time.

Final Discussion:

Overall, the correlation analysis was conducted to observe the ordinal scale multiple choice response options on the GroupHealth patient satisfaction survey. The multiple choice options for the patient to choose from when completing the survey included never, sometimes, usually, and always. In detail, as an extension of the ordinal variables, interval variables were used to quantify the values measured along the scale. In detail, the ordinal variables directly relate to the numeric interval variables to calculate the correlation and allow the quantitative aspect of the correlation to contribute to decision making when it comes to maximizing clinician ratings for clinician satisfaction. The correlation was therefore calculated to determine if there was a statistically significant relationship between clinician rating and explain understandably within the Group Health patient satisfaction survey results, and with a p-value substantially less than 0.05 the null hypothesis that there is no relationship between clinician rating and explain understandably was rejected displaying that there is a relationship between clinician ratings and explain understandably and when the provider explains understandably to the patient during the patient's visit the patient is likely to give the provider a favorable rating.

Next, a simple regression was conducted to further test the null hypothesis that there is no relationship between clinician rating and explain understandably. The accompanying t statistic was set to test the null hypothesis that the coefficient of explain understandably was equal to zero with the goal that the coefficient of explain understandably is significantly different than zero to help explain the variation in clinician ratings. In detail, the p-value proved to be less than 0.05 and again the null hypothesis was rejected, and now is more supported within the correlation and simple regression analyses as it is evident the variable of explain understandably significantly contributes to the explanation of the variance in clinician rating. Therefore, the variance in favorable and unfavorable clinician rating scores is related to the scoring of explain understandably on to the patient satisfaction survey.

Furthermore, multiple regression analyses were conducted to determine which variables specifically relate to clinician rating and assist in explaining the variation in total clinician satisfaction. The variables of interest to start included explain understandably, knowledge of medical hx, Total Panel Size, Panel - % Medicare, % Female, and Helpful-office staff. To increase the validity of the data set, those variables with p-values greater than 0.05 were removed until all the p-values were less than 0.05. For each process of removing a variable, a partial f test, amount of variable removed, and count of degrees of freedom were determined to calculate the partial f test p-value. With the partial f test null hypothesis being that there is no reduction in the explanatory power of the model. To highlight, the order of the removal of the variables included Total Panel Size, Helpful-office staff, panel - % Medicare, and % Female. The remaining two variables possessing p-values less than 0.05 were explain understandably and knowledge of medical hx, indicating that there is a correlation between clinician rating and knowledge of medical hx and clinician rating and explain understandably. Altogether, these variables signify the variables of interest for the scenarios and optimization analyses for further testing on the association between knowledge of medical hx and explain understandably on to clinician rating and overall clinician satisfaction.

In addition, nominal data was implemented to determine if there is a decrease in the explanatory power of the model through location in different parts of GroupHealth. Location is a nominal categorical variable, and a partial f-test and p-value showed that p was greater than 0.05 so the null hypothesis could not be rejected on that there is no decrease in explanatory power of the model through location, because it turns out the GroupHealth location is confounding the relationships between the variables. After that, the scenario summary was created based on the regression model and final percentiles made. Adjusting the variable results for explain understandably and knowledge of medical hx in the scenario summary identified that higher variable percentiles produced more favorable clinician ratings directly relating to receiving higher clinician satisfaction results from the patient. Later, optimization was implemented to determine the best solution to maximize clinician satisfaction at GroupHealth. The inputted variables were varied toward the clinician satisfaction objective, and in the end, it was found that in the clinician rating by category both explain understandably and knowledge of medical tx had high percentiles in association with clinician ratings, as well as the comparison of how certain the two variable correlate to clinician rating. Lastly, the addition of the dynamic chart allowed the scenario inputs to be selectively manipulated via the pull down menu and slider per outcome to see what a lower and higher ratio would look like against the clinician rating. The lower ratios had reflected poorly upon the clinician rating. To further visualize clinician rating, a Tableau dashboard was created to showcase average clinician rating by overall healthcare, clinician rating by district, average clinician rating by district, and average clinician rating by clinic.

Next Steps for Quality Improvement:

Due to a statistically significant relationship between explain understandably and overall clinician rating, opportunities for improvement at GroupHealth include provider training on communication and to readjust the GroupHealth appointment layout. For example, our quality improvement consultants will work with the GroupHealth Human Resources department to develop workforce contribution in communication skills trainings in order to enable the GroupHealth clinicians to take additional communication courses as a method to improve continuously and expand on their working knowledge of the best form of communication to effectively explain understandably to each patient per visit. Specifically, the courses will include application of communication within the patient-provider relationship to satisfy the need for the GroupHealth clinician communication to be composed of a shared purpose with the patient, direct information understandable by the patient, and all with an empathetic provider stance. In addition, readjusting the GroupHealth appointment layout to give more time for providers to discuss the diagnosis and discharge items will give the providers more time to connect with the patients, and use their courses on how to communicate in order to explain understandably to the patient during their visit with GroupHealth.

Moreover, knowledge of medical history also shows a significant relationship to overall clinician rating. Likewise, opportunities for improvement are present to continuously improve the patient-provider experience. For instance, in this case we would recommend updates to the healthcare organization's electronic medical record to include the addition of triggers, hard stops, and warning signs. The underlying purpose with the updates to the electronic medical record is to clearly show

the provider the patient's medical history, and to remind the provider the importance of reviewing the patient's medical history when it comes to treating the patient and improving the patient's overall satisfaction with the clinician.

Executive Summary:

Overall, in 2017 Kaiser Permanente acquired Group Health Cooperative with the goal of providing high-quality care, but high-quality care can only be achieved with the addition of clinician satisfaction. To quantify clinician satisfaction and administer high-quality care, Group Health utilizes patient satisfaction surveys as measuring tools to determine the patient's experience with the clinician. The purpose of this study to recognize relationships, correlations, and associations between clinician rating (0-10) and the independent continuous variables selected from the Group Health patient satisfaction survey data report as a method to build supported recommendations for Group Health to improve service excellence by strengthening the physician-patient experience (clinician satisfaction).

Moreover, clinician rating was chosen to be the dependent variable because clinician rating explains how the patient felt about the quality of care they received from their provider. Then, twenty independent continuous variables were selected because clinician rating is based on several different independent variables. The independent variables studied were from the Group Health patient satisfaction survey, and the corresponding survey results are what initiated further tests and analysis to pinpoint which independent variables were associated with clinician rating, and opportunities for improvement needed to reach favorable clinician satisfaction with the GroupHealth patient population. To begin, descriptive statistics of clinician rating for all districts within the sample size combined and for each district separately within the sample size was used to find a statistical relationship between the two variables, and a confidence interval between clinician rating and the districts to identify any potential variance within the districts' clinician rating means. Additionally, the proposed hypothesis graphs including a histogram showcasing the clinician rating of the Central and Southern region revealed that there was no statistically significant difference between the Central and Southern regions when it came to clinician rating. On the other hand, another graph that was on the size of district and clinician satisfaction depicted a negative correlation between the rating of the clinician and the panel size for each district except for Olympia. Meaning that as panel size increased clinician rating decreased. Next, two other graphs displayed that there is a possibility of a positive correlation between the independent continuous variables of ability of clinician to explain understandably and wait time explanation with clinician rating. Then, to better understand the relationship between clinician rating and the independent variables statistical analysis and tests were conducted.

Furthermore, the statistical analysis included standard error, confidence interval, z-test, f-test, t-test, ANOVA, Tukey test, Mann-Whitney, Kruskal Wallis, and chi square. The standard error and confidence interval were used to compare the South and Network regions because of their similar sample size, and the z-test found that there is a statistically significant difference between mean clinician rating in the South and Network regions. Which makes sense as the regions respectively

scored the lowest and highest performing in clinician satisfaction. Then, the f-test and t-test were used to uncover that there is no statistically significant difference between the variance of the distribution and in between the mean clinician rating in the districts of Olympia and Northgate. The t-test was conducted following the f-test to confirm that the variances are equal, and we were unable to reject the null. Following that, the ANOVA was used to determine the difference between mean clinician rating within Olympia, Northgate, Riverfront, and Capital Hill. The ANNOA found there to be a difference in mean level clinician satisfaction across the selected clinics, and a Tukey test was performed to examine the variation and to uncover that there is significant difference between the mean clinician rating within the four clinics. In addition, a Mann-Whitney was conducted, and since the U value was larger than the critical statistic of five, we were unable to reject the null hypothesis as the clinics of BRN and EVM proved to have no statistically significant difference between median clinician ratings. However, with the Kruskal-Wallis the p-value was less than 0.05 so we were able to reject the null hypothesis because there proved to be a statistically significant difference in median clinician ratings between the BRN, CDA, and EVM clinics. Lastly, for the statistics analysis the chi square test found that there is an association between clinician ratings and the districts at GHP. However, there may be other factors affecting the results.

Most recently, correlational and regression analyses continued to determine which variables were truly related to clinician rating and the patient's overall satisfaction with the clinician. Correlational analyses hinted at the relationship between providers explaining understandably at the appointment to clinician rating, which was confirmed through regression analysis. Subsequently, regression analysis determined that the provider's knowledge of the patient's medical history in addition to explaining understandably at the appointment contributed to a strong correlation to clinician rating.

Altogether, future goals for GroupHealth would be to focus on how much the improvement in the providers explaining understandably and medical history knowledge during the patient's visits would impact the clinician rating scores on the patient satisfaction survey. Further analyses with updated survey results following the implementation of the above quality improvement measures should include additional scenario predictors, optimization models, and dynamic charts to assist in predicting how the changes in the independent variables affect the dependent variable of clinician rating scores (0-10). In order to reach the point to conduct further tests and analyses, GroupHealth must initiate provider communication trainings, readjust the appointment visit layout and structure to give more time to communicate with the patient, and update their electronic medical record system to emphasize the requirement to have extensive knowledge of the patient's medical history when treating the patient.

Executive Summary Findings:

- There is no statistically significant difference between the Central and Southern regions when it comes to clinician rating.
- There is a negative correlation between the rating of the clinician and the panel size for each district except for Olympia.

- As panel size increases clinician rating decreases
- There is a positive correlation between the independent continuous variables of ability of clinician to explain understandably and wait time explanation with clinician rating.
- z-test found there is a statistically significant difference between mean clinician rating in the South and Network regions.
- The f-test and t-test uncovered that there is no statistically significant difference between the variance of the distribution and in between the mean clinician rating in the districts of Olympia and Northgate.
- The ANNOA found there to be a difference in mean level clinician satisfaction across the Olympia, Northgate, Riverfront, and Capital Hill clinics, and a Tukey test uncovered that there is significant difference between the mean clinician rating within the four clinics.
- Mann-Whitney proved the clinics of BRN and EVM to have no statistically significant difference between median clinician ratings.
- Kruskal-Wallis proved a statistically significant difference in median clinician ratings between the BRN, CDA, and EVM clinics.
- Correlational analyses hinted at the relationship between providers explaining understandably at the appointment to clinician rating, which was confirmed through regression analysis.
- Regression analysis determined that the provider's knowledge of the patient's medical history in addition to explaining understandably at the appointment contributed to a strong correlation to clinician rating.

Executive Summary Improvements on Clinician Satisfaction:

- Group Health to quarterly examine patient satisfaction survey results in relation to clinician satisfaction
- Group Health to initiate quarterly required provider communication trainings
- Group Health to readjust the appointment visit layout and structure to give more time to communicate with the patient
- Group Health to update their electronic medical record system to emphasize the requirement to have extensive knowledge of the patient's medical history when treating the patient.

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Appendix - Patient Experience Survey

According to our Group Health records, you recently visited the clinician and medical center on the date listed in the letter. Please think about this visit as you answer the questions below.

Please answer the following questions by filling in the bubble with a blue or black pen or pencil.



During your visit:

Never Sometimes Usually Always

How often did your clinician:

- | | | | | |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| 1. <u>Listen carefully to you?</u> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 2. <u>Explain things in a way you could understand?</u> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 3. <u>Spend enough time with you?</u> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 4. <u>Show respect for what you had to say?</u> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 5. Put your <u>best interests first</u> when making recommendations about your care? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 6. Have the information needed to <u>correctly diagnose and treat</u> your health problem? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 7. Have <u>knowledge of your medical history?</u> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

How often did clinical support staff:

- | | | | | |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| 8. Be as <u>helpful</u> as you thought they should be? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 9. Treat you with <u>courtesy and respect?</u> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

How often did office staff:

- | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| 10. Be as <u>helpful</u> as you thought they should be? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 11. Treat you with <u>courtesy and respect</u> at check-in? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

During your visit:

No Yes NA

- | | | | |
|--|-----------------------|-----------------------|-----------------------|
| 12. Were you taken to the exam room <u>within 15</u> minutes of your appointment? | <input type="radio"/> | <input type="radio"/> | |
| 13. If you had to <u>wait more than 15 minutes</u> after your appointment time, were you given an explanation? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

14. Using any number from 0 to 10, where 0 is the worst clinician possible and 10 is the best clinician possible, what number would you use to rate the clinician that you saw during your most recent visit?

← Worst clinician										Best clinician →				
0	1	2	3	4	5	6	7	8	9	10				
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				

Please Continue