

# Quality Competition in the Dialysis Industry

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## Abstract

This paper estimates the relationship between market structure and the quality of medical care in the dialysis industry. I use a new five-star rating of quality constructed by UM-KECC. I use the driving time for potential patients to define the market. I assume a dialysis care facility only serves those patients within a specific driving-time radius. I find that the quality ratings of monopolists are lower than those are facilities that face competition. The number of competitors, defined as facilities of rival chains, in a firm's market does not affect the ratings. The number of competing facilities within the same chain is positively correlated with the ratings.

## 1 Introduction

By December 2016, over 700,000 patients were diagnosed with end-stage renal disease (ESRD) in the US. These patients' kidneys were no longer able to function properly. The two options for these patients are dialysis or getting a kidney transplant. According to the annual report by the United States Renal Data System, only 2.8% of patients received a kidney transplant. So most of ESRD patients have to rely on dialysis for many years (USRDS, 2018).

Dialysis is a treatment that cleans the blood waste out of patients' bodies, a task normally performed by kidneys. In 1972, the US Congress passed a law giving patients with ESRD coverage under Medicare. Because of this, the payment of dialysis became a big part of the Medicare payment. Between 2015 and 2016, 7.2% of the overall payment of Medicare was dialysis treatment related (USRDS, 2018).

Patients can either choose hemodialysis or peritoneal dialysis. Almost 90% of ESRD patients choose to do hemodialysis at a dialysis facility. Because of the prevalence and high cost of dialysis, the

government closely regulates the dialysis industry. The quality of care for dialysis treatments is very important to patients, physicians and the government.

Quality of care can be categorized as quality of medical care and quality of non-medical care. Patients care about both, including non-medical quality of care, such as TVs. However, the quality of non-medical care is hard to observe by researchers. Moreover, patients care mainly about quality of medical care, such as the mortality rate.

The better is the quality of care at these facilities the more attractive they are to patients. This paper analyzes the effect of competition on product quality in dialysis industry. Since Medicare is the predominant payer, the price of dialysis treatment is very largely predetermined and does not influence patient decisions. This means that the price of the dialysis treatment does vary with the quality of care.

The hemodialysis treatment is a standardized procedure that can easily be compared across all those facilities, and measurements of medically related quality of care are prevalent among all healthcare sectors. The government tries to inform the patients and physicians about the quality of care of each facility using a website called Dialysis Facility Compare. Patients and physicians can easily get information about how well dialysis centers care for their patients, such as mortality rate and hospitalization rate.

Many papers in the health care literature have found that competition increases the quality of care (Kessler and McClellan, 2000; Kessler and Geppert, 2005). However, there is not much research that finds that competition increases the quality of care in the dialysis industry (Cutler et al., 2012; Grieco and McDevitt, 2016; Held and Pauly, 1983).

In this paper, I use a new measurement of the quality of patient care. Since 2013, the Dialysis Facility Compare website constructed a new five-star rating method. This method combines nine measurements of medical quality of care together, and gives facilities a rating which is very similar a hotel rating. It is very easy for patients to compare the quality of medical care among facilities. Before 2013, these nine measurements were reported separately and were more difficult to interpret.

Other than the quality of service, patients respond to the convenience of those dialysis facilities sensitively. Patients who need dialysis treatments have to go to a facility three times a week.

Because travel is so common, two facilities that are sufficiently far away from each other are not in the same market, and they do not compete with each other. Previous research on quality in health care markets has used the HHI within a county or health service areas to measure competition. But when patients choose facilities, it is not necessarily to choose a facility in their residency county Wilson (2016). It is very common for patients to get treatments from a facility that is not in their residence county. While researchers have also used the health service area to define a market (Dai and Tang, 2015), sometimes the health service area passes across the state boundary. Two facilities that are in the same health service area but in different states may not be in the same end-stage renal disease network. There are 18 networks in the US, and each of them covers a specific geographic region. Those networks offer resources for patients and their families. They also oversee dialysis and transplants facilities across the nation. This network effect affects facilities differently across different networks. In this paper, I define competitors using the real travel time between facilities. If the travel time from one facility to the other is within the specified travel time, then that facility is a competitor. Because the travel cost is so high to the patients, it is very rare that patients are willing to travel far to a better quality facility (Eliason et al., 2018). There may be a chance that patients are willing to change their residence to some locations with better quality providers. One important characteristic of my definition of competition is that it varies by firm. That is, if firms A and B are close, then they are competitors of each other, but other competitors of A need not be competitors of B.

Empirically, the observed variation in competition is across markets, not within a market. The variation of competition within a market has to be associated by new entries or acquisitions. This paper only uses the variation across different markets, because there are very few if any changes in market structure over time after the five-star rating system was put in place.

There are two types of dialysis facilities, hospital-based and free-standing. Hospital-based facilities usually follow the same rules of their associated hospitals. The rating of a hospital-based facility is very close to the rating of the associated hospital. Free-standing facility is a facility that only offers dialysis treatment to patients and it is not a unit of any hospital. The results show the quality of care is not different between two types of facilities.

The medical outcomes are worse for patients with comorbidities than those patients without them.

Because the patients in some facilities have more complicated conditions, the medical outcomes turn out to be bad. And the comorbidities also relate to the market structure. Less competitive markets show a lower number of comorbidities than other markets. Controlling for comorbidities in the analysis is necessary.

The remainder of this paper is organized as follow: Section 2 introduces the data, Section 3 describes the methodology, Section 4 provides summary statistics, Section 5 presents the empirical results, and Section 6 provides concluding remarks.

## **2 Data and Methodology**

### **2.1 Data**

The primary data source is the Quarterly Dialysis Facility Compare Report. This report is produced by the University of Michigan Kidney Epidemiology and Cost Center that is funded by the Center for Medicare and Medicaid Services. These reports include information about patients' health outcomes, such as mortality, hospitalizations, hospital readmission, and transfusions. Based on these patients' outcomes, UM-KECC provides a five-star rating for every dialysis facility

The second data source is the Dialysis Facility Report. This report is produced by UM-KECC too. This report includes information about the number of patients and the average number of comorbidity conditions for each dialysis facility.

The third source of data is the Dialysis Cost Report from 2013 to 2016 for the Healthcare Cost Report Information System (HCRIS). Medicare-certified institutional providers are required to submit an annual cost report to a Medicare Administrative Contractor (MAC). The cost report contains provider information such as facility characteristics, utilization data, cost and charges by cost center (in total and for Medicare), Medicare settlement data, and financial statement data. Facility characteristics include the capacity and the patient flow of dialysis centers which I use when calculating the market structure.

The fourth source of data is the American Community Survey. This data source provides the demographic and economic information for selected zip code, such as population, household income,

age, education attainment, and percentage of people who are covered by public health insurance.

I obtain the location of each dialysis facility from two sources: The U.S. Gazetteer Files, generated by the United States Census Bureau, provides the zip code centroid latitude and longitude coordinates. And the Here Maps API provides the latitude and longitude coordinates for each dialysis center using its street address, and also is used to calculate the driving distance and time for each pair of facilities and each facility/zip code centroid pair.

## 2.2 Methodology

### 2.2.1 Market definition

Each facility has its serving area, which is the area that patients who choose to get treatments from this facility live. The radius of this serving area is the maximum travel time for patients. When two facilities' serving areas overlap with each other, the patients who live in the overlapped area can pick either of these two facilities. Then, these two facilities compete with the patients who live in this area. If two facilities' serving areas do not overlap with each other, then these two facilities do not compete with each other.

I define  $N$  as the number firms within New England, and denote firms by  $i = 1 \dots N$ . Each facility's serving area is denoted by  $S_i$ . The Maximum travel time that patients take is  $D_{max}$ . The size of the serving area is  $\pi$  times the square of  $D_{max}$ .

In figure 1, there are five firms. Firm  $A$ 's serving area is the red circle. Firm  $B$ 's and  $C$ 's serving areas are the two green circles. Firm  $D$ 's serving area is the blue circle. Last, firm  $J$ 's serving area is the grey circle. The radius of these serving areas is the maximum travel time that patients take. The serving areas of firm  $A$ ,  $B$ , and  $C$  overlap with each other. From firm  $A$ 's point of view, firm  $B$  and  $C$  are its competitors. The serving areas of firm  $A$  and firm  $D$  only interact at the point  $I$ . The only area that these two firms compete is the point  $I$ . Firm  $D$  is firm  $A$ 's competitor too. Firm  $A$  and  $J$ 's serving area are not overlapped. Firm  $J$  is not firm  $A$ 's competitor.

Using the distances between two facilities can define competitors too. If the distances between two facilities are less than  $2D_{max}$ , these two facilities are competitors. In figure 1, the distance from

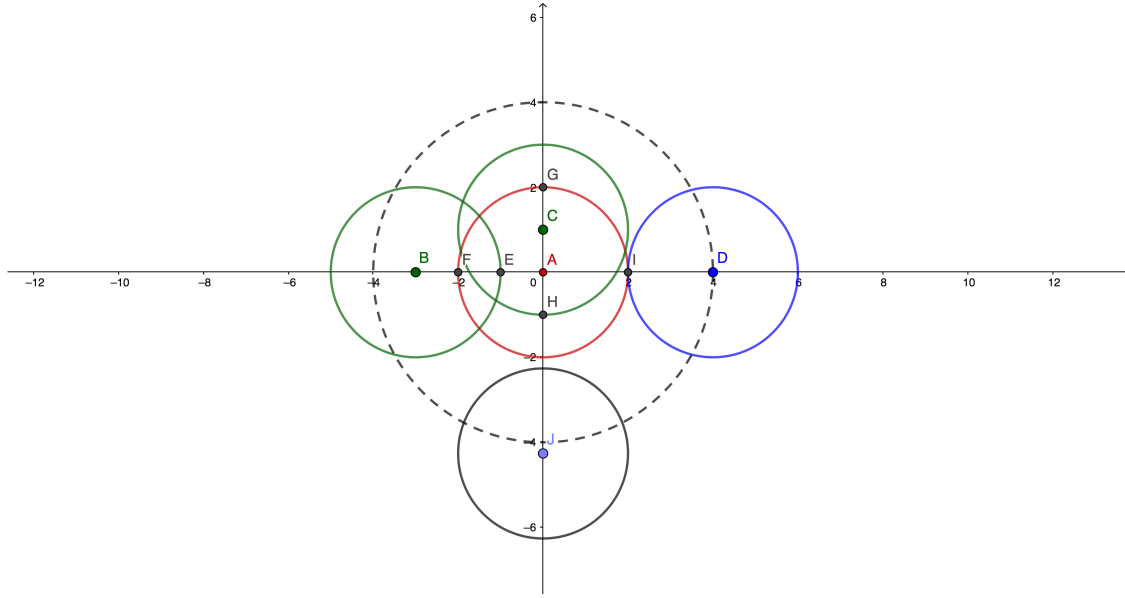


Figure 1: Market Definition

point  $A$  to point  $B$  and the distance from point  $A$  to point  $C$  are less than  $2D_{max}$ . Then, firm  $B$  and  $C$  are competitors of firm  $A$ . Any firm within the dash line circle is firm  $A$ 's competitor. The radius of this dash line circle is  $2D_{max}$ .

In figure 1, firm  $B$  and  $C$  are owned by the same chain and firm  $A$  and  $D$  are independent or hospital-based. Firm  $A$  only has one type of competitors that are the non-same brand competitors, firm  $B$ ,  $C$ , and  $D$ . On the other hand, firm  $B$  has two types of competitors. Since firm  $B$  and  $C$  are associated with the same chain, firm  $C$  is firm  $B$ 's the same brand competitors. Firm  $A$  is firm  $B$ 's the non-same brand competitor.

This market definition includes the travel distance into the analysis. Compared to many other types of health care services, patients who need dialysis are repeat shoppers. Since they need to get the treatment three times a week, the travel cost is a larger part of the expenditure associated with the dialysis. In order to use the Herfindahl-Hirschman Index (HHI) to measure market concentration, the overlapped markets are not allowed. Because of the geographic locations of these dialysis facilities, patients who live in some areas do not have a clear preference between two facilities. It is very hard to identify an area that patients live all have the same choices.

Using counties or health service areas to define the market, some facilities are assigned to a market

that they are don't serve. The health service area is the area that patients choose to get hospital service. Since ESRD patients need to get dialysis treatments three times a week, the willingness to travel is less than those patients that need hospital service. The health service area is larger than the actual dialysis market. Almost all the patients are covered by Medicare. They can easily pick a facility that is not in their residency county if this facility is more convenient, especially those patients live close to the geographic boundary. Those facilities that locate close to the county boundaries compete with facilities in the neighbor county. The market definition in this paper uses the distance between facilities to define competitors. Any facility within a specific distance is a competitor.

Using counties or health service area to define market also bias the results. Since the market is not the true market, the HHI calculated for each market have been measured with errors. This measurement error causes attenuation bias. It leads the coefficient of the independent variable to zero. This may be one of the reasons that previous research did not find competition increases the quality of care.

I estimated simple regressions using the HHI as a measure of competition where I defined the market using the county. I found that the HHI in the current year does not affect the quality of care of dialysis facilities. However I did find that as the HHI last year decreases, the quality of care increases. These results are from table 12 to table 16 in the Appendix.

### **2.2.2 Model**

The model I estimate is

$$Quality_i = MarketStructureIndicator_i + FacilityCharacteristics_i + Year_i + State_i + \epsilon \quad (1)$$

### **2.2.3 Dependent variables**

*Quality<sub>i</sub>* is measured by a new five-star rating system, which is provided by the University of Michigan Kidney Epidemiology and Cost Center(UM-KECC). This organization is a contractor of the Centers for Medicare & Medicaid Services(CMS). It uses the Dialysis Facility Compare Star

Rating System to evaluate the medically related quality of care for every facility. The rating scale is from 1 to 5. Three stars mean the quality of care of one facility is equal to national average quality. Five-stars indicates the quality of care that one facility provided is much better than the national average quality of care. Facilities with one star whose quality of care at these facilities are below average.

There are nine quality measures used in star rating calculation. They are three domains for these nine measures. The first domain includes standardized transfusion ratio (StrR), standardized mortality ratio (SMR), and standardized hospitalization ratio (SHR), which is named as standardized outcomes. The standardized mortality rate equals the ratio of the actual number of death divided by the expected number of death. For example, one facility's standardized mortality ratio equals 1.10, then it means this facility's death rate is 10% higher than the national death rate. The calculations of standardized transfusion ratio and standardized hospitalization ratio are very similar to standardized mortality ratio. For the quality of care for dialysis facilities, the lower these three ratios, the better the quality of care.

The second domain includes the percentage of adult patients who received treatment through an arteriovenous fistula, and percentage of adult patients who had a catheter left in a vein 90 days or longer, for their regular hemodialysis treatment. If one facility has a lower percentage of these two measures, this facility provides a better quality of care.

The third domain of quality measurement includes the following, percentage of adult hemodialysis patients who had enough waste removed from their blood during dialysis:  $Kt/V$  greater than or equal to 1.2; percentage of pediatric hemodialysis patients who had enough wastes removed from their blood during dialysis:  $Kt/V$  greater than or equal to 1.2; and percentage of adult peritoneal dialysis patients who had enough wastes removed from their blood during dialysis:  $Kt/V$  greater than or equal to 1.7. The higher rate of patients could get enough wastes removed from their blood, the better the quality of care that one facility can provide.

Due to not enough observations of the percentage of pediatric hemodialysis patients and the percentage of adult peritoneal dialysis patients, these two measures are not included in the analysis.



### 2.2.4 Independent variables

The market indicator are measured by two ways, monopoly, natural log of number of competitors and the rate of overlap.

First, the market indicator is monopoly. If one facility's serving area overlaps with zero facility, this facility is a monopoly in its market. The market indicator is equal to one. If one facility's serving area overlaps with N ( $N > 0$ ) facilities, this facility is not a monopoly. The market indicator is equal to zero.

Second, the market indicator is natural log of number of competitors. If one facility' serving area overlaps with N ( $N \geq 0$ ) facilities' serving area, the number of competitors is equal to N.

Third, the market indicator is rate of overlap. It is equal to the sum of ratio of overlapp distance and radius of serving area. In Figure 1, firm A's overlap rate is equal to

$$\frac{2D_{max} - AB}{2D_{max}} + \frac{2D_{max} - AC}{2D_{max}}$$

## 3 Summary Statistics

The final data set is from 2013 to 2016. There are 194 facilities are in this data, 167 independent facilities, and 24 hospital-based facilities. One hundred and seventy six facilities appear four years. The total number of observations is 742. In 2014, there were 5 new entrants and two exits in New England. In 2015. There were 7 new entrants and one exit. In 2016, there were 2 new entrants and one exit.

Eighteen facilities don't have four years observations in the data. Then, the total number of markets is 176, because I do not want the new entries or exits to create or destroy markets. There are 48 facilities in Connecticut, 83 in Massachusetts, 17 in Maine, 18 New Hampshire, and 16 Rhode Island, and 8 facilities in Vermont. The number of facilities did not change in New Maine, Hampshire and Vermont. There was only one entry in Rhode Island in 2016. The rest of the entries and exits happened in Connecticut and Massachusetts. The total number of counties in these 6 state is 56.

In table 1, on average, patients need to travel 23 minutes to get to the closest facility, and 29 or 30 minutes to get the second and third facility. Patients who live in Massachusetts, Connecticut, and Rhode Island travel less than those who live in Maine, New Hampshire and Vermont.

The driving time should be lower if the average driving time is weighted by population. Then, I picked 15-minute, 20-minute, and 25-minute to be the serving area radius. Patients should have at least two dialysis facilities to choose if they are will to travel 25 minutes. In some states, patients can get two choices if they are willing to travel 20 minutes. So, 15-minute, 20-minute, and 25-minute are the most common driving times that patients would pick.

In table 2 if market is defined by county, there are 16.7% of facilities are monopolists. For free-standing facilities, 14.2% of them are monopolists. For hospital-based facilities, 34.4% of them are monopolists.

Using travel time radius to define a market, the probability of being a monopolist is higher if one facility is hospital-based. In the 15-minute radius, 15.4% of facilities are monopolists. Forty-three percent of hospitals are monopolists, and 11.4% of free-standing facilities are monopolists. Twenty-nine percent of the hospitals are monopolists in the 20-minute serving area and 24.7% of the hospitals are monopolists in the 25 minutes serving area. The chance of a free-standing facility to be a monopoly is 7.4% in 20 minutes serving area and 3.7% in 25 minutes serving area. The probability is the highest when dialysis facilities only compete with those facilities within the same county.

In table 3 shows the summary statistics of the number of competitors. When each county is considered as a market, on average, the number of competitors is 5.726. When the market is defined by travel time radius, the average number of competitors is 17 for 20-minute radius. When the serving area is 25 minutes, the average number of competitors is 25. Free-standing facilities usually have more competitors than hospitals. the rate of overlap increases as the serving area radiuses increase. Because the formula of the rate of overlap, the more the number of competitors is, the higher the value of the rate of overlap.

In table 4, the five star rating is higher if a facility is a free-standing facility. The Standardized transfusion ratio and standardized hospitalization ratio are lower if facilities are hospital based. The

values of these two measurements are the lower the better. On the other hand, the standardized mortality rate is higher if facilities are hospital based. If value of the standardized mortality is lower than other facilities, the mortality rate is lower than other facilities. The value of percentage of adult hemodialysis patients whose Kt/V are greater or equal to 1.2 of free-standing facilities are higher than hospital based facilities. Also more percentage of adult patients have Fistula for free standings than hospitals.

Table 5 shows the summary statistics of the control variables. The number of comorbidities condition measures the average number of comorbidities condition for facilities. Most of the patients that need dialysis treatment are with some comorbidities, such as diabetes. On average, the average number of comorbidities condition is 5.3. The minimum number of comorbidities for facilities is 2, and the maximum number of comorbidities is 9.

The data of demographic information are zip code level. All these demographic variables in the regressions are market level. For example, the population in the 20-minute serving area is the sum of all the population of zip codes that they are centroids are within 20 minutes driving time. The percentage of people who are covered by public health insurance is equal the ratio of the total number of people who are covered by public health insurance of zip code that they are centroids are within 20 minutes driving time and the total population of zip codes that they are centroids are within 20 minutes driving time.

The population for each serving area varies much. For example serving area within 20 minutes, the total population is from 2206 to 1163324 number of people. The average income for 20 minutes serving area is from 19676 to 60465 dollars, and the average income is 33294. The percentages of people whose ages are over 65 are very similar across different radiuses. The average percentage of people who are covered by public health insurance does not vary much across different radiuses. The percentage of Bachelor Degree increases as the radius increase.

## 4 Results

In table 6, the results show three different radiuses, the 15-minute, the 20-minute and the 25-minute. Most of patients should have two facilities to choose within these three radiuses. In model (1), (4), and (7), the coefficients of monopoly are negative. The ratings of monopolists are lower across all the radiuses. The first three regressions show dialysis facilities that are monopolists have lower rating than those facilities that are non-monopolists in the 15-minute radius. Model (1) is the basic model includes hospital and number of comorbidities as control variables. The coefficient of hospital shows the ratings of hospital-based facilities are 0.2172 lower than free-standing facilities. On average, if one facilities' patients with one more comorbidities conditions, the rating is 0.2744 lower. Model (2) and Model(3) includes one more control variable, natural log number of patients or natural log number of machines. The log number of patients measures the quantity of each facility, and the natural log of number of machines measures facilities' capacity. The results show that the larger number of patient flow reduces the rating of dialysis facilities. The natural log of number of machines measures the capacity of each facility. The higher capacity facilities rating is lower than lower capacity facilities. This is constant with Wilson's (2016) paper. From model(4) to model(6), the market is defined as 20-minute serving area. The ratings of monopolists are 0.4977 lower than those non-monopolists. The hospital-based facilities get lower rating. Facilities that have sicker patients get the lower rating. From model(7) to model(9), the radius increases to 25 minutes. The facilities that are monopolists get lower ratings as other two market definitions. Therefore, in dialysis industry, market concentration reduce the medical outcomes.

All these regressions include the year fixed effects, brand fixed effect, and state fixed effect. Facility fixed effect is not included because each facility is a market. The facility fixed effect is the same as the market fixed effect. When controlling for market fixed effect, the variation of the market structure changes only come from new entering or exiting. The demographic control variables are population, the percentage of people whose ages are over 65, the percentage of people who have public health insurance, average income, and percentage of people who have a bachelor degree. Since I do not observe the data that the number of patients needs dialysis treatment for each zip code area. I use population, the percentage of people whose age is over 65, and the percentage of people

who have public health insurance to control the demand for each zip code area. Research(need reference) shows that the probability of ESRD is much higher if people' age is over 65. Also, almost every patient with ESRD is covered by Medicare. The probability of being ESRD is very high for those whose age is lower than 65 but covered by Medicare. People with better education background follow doctors and nurses' instructions better than others. They actively cooperate with doctors and nurses. The medical outcomes are better than others(needs reference).

In table 7, the method of defining monopoly is different from the previous table. In this table, same brand facilities are not considered as competitors. Monopoly is equal to one if there is no facility that is not the same brand. For example, there are two facilities, and both of them are DaVita. The travel time between these two facilities is less than 40 minutes. In this case, both of these facilities are monopoly in 20 minutes serving area. In this table, monopolist facilities' ratings are lower than those non-monopolist facilities. Hospitals' rating are lower than free-standings'. Higher average number of Comorbidities reduces the rating for all the facilities. For a DaVita facility, if there is no other facility within 40 minutes, the monopoly variable is equal to one. If there is another DaVita facility within 40 minutes, the monopoly variable is equal to one too. In order to distinguish these two situation, I included an interaction term to indicate if there are facilities are the same brand. The coefficient of this variable is positive. If one facility has no competitor from other chains or independent facilities within 40 minutes or 50 minutes, but there are facilities with the same brand, the rating of these facilities are higher than those monopolist that without same brand facilities. The rest of the models include the same control variables as the previous table, and the results are very similar.

In table 8, the measurement of competition is by variable natural log number of competitors. From this table, the coefficients of natural log number of competitors are positive. These results show that competition increase the ratings of dialysis facilities. Those facilities with more number of competitors has the better rating of their medical outcomes. Still, hospitals' rating is lower than free-standings'. Higher number of average comorbidities reduces the rating of facilities. The control variables of quantity and capacity are not statistically significant.

In table 9, I separated the number of competitors into two groups. One is the natural log number of competitors, which is the number of facilities with different brands. The other is natural log

number of same brand, which is the number of facilities with the same brands. The number of competitors with different brand does not affect the rating of dialysis facilities. On the other hand, the coefficient of ln number of same brand are positive and statistically significant. Facilities with the same brand locate with each other get better rating.

In table 10, the measurement of competition is by the variable rate of overlap. From this table, the coefficients are negative for the 15-minute and 20-minute radiuses and positive for 25-minute radius. None of these coefficients are statistically significant. The rate of overlap does not affect the rating of dialysis facilities in general. Still, hospitals' rating is lower than those free-standing'. The higher number of average comorbidities reduces the rating of facilities. The control variables of quantity and capacity are not statistically significant.

In table 11, I separated the number of competitors into two groups too. Then, I calculated the rate of overlap with the same brand and the rate of overlap with the non-same brand. The rate of overlap with the non-same brand does not affect the rating of dialysis facilities. On the other hand, the coefficients of the rate of overlap with the same brand are positive and statistically significant. Big chain companies affect the rating of dialysis facilities positively.

The quality of care for dialysis facilities is a choice of those facilities. They can reallocate their resource to change the quality of care they provide. The entry and exit decisions of dialysis facilities are affected by the quality of care of incumbents, so the market structure may affect by the quality of care. In this sample data, very few facilities choose to enter and exit the dialysis industry.

## 5 Robustness Check

The willingness to travel is different between the patients who live in an urban area and rural area. Then, I ran a set of regressions using driving distance to define a market. Previous research shows, on average in the US, patients are willing to travel 7.9 miles. For those patients who live in a rural area, they travel 2.5 times than those who live in an urban area, 15.9 miles to 6.2 miles Stephens et al. In my simple, the mean travel distance to the close facility is 12 miles, and patients who live in rural area have to drive two times farther than those patients who live in urban area. The results

that using driving distance to define market are in the Appendix table 18 to Table 23. Competition does not affect the rating when a monopoly is the market structure indicator. The results are very similar to those regressions that use driving time to define the market. Comparing the results using driving distance to those results using driving time, market definition affects the results significantly.

## 6 Conclusion

This paper used the new measurement of quality of care for dialysis facilities to analyze the relationship of quality of care and market structure. The quality of care is measured by the five-star scale rating. This rating represents the medical outcomes of dialysis facilities. This new rating is very easy for patients and physicians to compare the medical outcomes with facilities. Since this rating is constructed by nine medical outcomes, it reflects the quality of care of dialysis facilities comprehensive.

I used a new method to define market in this paper. The market is defined by travel time radius. Facilities that with a specific travel radius are considered as competitors. This is more close to the reality. The results show that competition increases the quality of care for dialysis facilities. Monopolists' quality of care is lower than non-monopolists. In addition, the quality of care for facilities with more number of competitors is higher than those facilities with less number of competitors. In addition, I categorized facilities' competitors into two group, the same brand competitors and the non-same brand competitors. The results show only the same brand competitors has an effect on the rating of dialysis facilities. As the number of competitors from the same chain increases, the rating increase too.

The quality of care is lower in more concentrated market. The ratings of monopolists are lower than those non-monopolists. Any activities that increase the number of monopolists may cause a reduction of medical outcomes. When patients try to pick a facility to get dialysis treatment, it is good that they can at least have two choices. The results also show that the ratings of facilities with more the same brand competitors are higher. The big chain companies have high standard of operating requirements that try to keep their reputation. They can easily share their resources between facilities. When a big chain company try to purchase independent facilities, the quality of

care may not be affected. The results indicate the facilities with bigger capacity or larger patient flow get lower rating. Although the coefficients are not statistically significant, it is better for patients to have more locations to choose and smaller capacity facilities to get treated.

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Table 1: Summary Statistics to Closest Facility from Zip Code

	Mean	Std.Dev.	25 Percentile	Median	75 Percentile	Obs
Time to Closest Facility	23.702	14.325	12.933	20.858	32.425	6828
Time to Second Closest Facility	29.367	15.918	16.975	27.117	39.167	5444
Time to Third Closest Facility	29.891	16.045	18.617	27.967	37.967	4390

Table 2: Summary Statistics of Market Structure Indicator by Facility Type

	0			1			Total		
	Mean	Std.Dev.	Obs	Mean	Std.Dev.	Obs	Mean	Std.Dev.	Obs
Monopoly in a County	0.142	0.349	649	0.344	0.478	93	0.167	0.373	742
Monopoly in 15 Mins	0.114	0.318	649	0.430	0.498	93	0.154	0.361	742
Monopoly in 20 Mins	0.074	0.262	649	0.290	0.456	93	0.101	0.302	742
Monopoly in 25 Mins	0.037	0.189	649	0.247	0.434	93	0.063	0.244	742

Table 3: Summary Statistics of number of competitors by facility type Facility Type

	0					1					Total				
	Mean	Std.Dev.	Median	Max	Obs	Mean	Std.Dev.	Median	Max	Obs	Mean	Std.Dev.	Median	Max	Obs
NO. Competitors in County	7.550	5.418	8.000	17.000	649	4.968	5.255	2.000	17.000	93	7.226	5.461	8.000	17.000	742
Number of Competitors in 15 Mins	10.488	7.784	11.000	32.000	649	8.140	9.619	1.000	28.000	93	10.194	8.068	10.000	32.000	742
Number of Competitors in 20 Mins	17.784	12.051	18.000	43.000	649	12.161	14.288	2.000	46.000	93	17.080	12.482	17.000	46.000	742
Number of Competitors in 25 Mins	26.516	15.832	27.000	61.000	649	16.645	18.535	2.000	51.000	93	25.279	16.509	26.000	61.000	742
Rate of Overlapped in 15 Mins	3.335	2.623	3.391	11.262	649	3.305	3.677	0.644	10.654	93	3.332	2.774	3.370	11.262	742
Rate of Overlapped in 20 Mins	6.000	4.296	6.218	17.072	649	5.043	5.744	0.905	17.046	93	5.880	4.509	6.028	17.072	742
Rate of Overlapped in 25 Mins	9.200	6.073	9.805	23.224	649	6.903	7.861	1.124	23.144	93	8.912	6.364	9.164	23.224	742

Table 4: Summary Statistics of Quality by Facility Type

	0			1			Total		
	Mean	Std.Dev.	Obs	Mean	Std.Dev.	Obs	Mean	Std.Dev.	Obs
Rating	3.606	0.984	601	3.103	1.174	68	3.555	1.016	669
Standardized Transfusion Ratio	0.893	0.510	579	0.796	0.369	54	0.885	0.500	633
Standardized Mortality Ratio	0.880	0.202	600	1.043	0.515	81	0.899	0.264	681
Standardized Hospitalization Ratio	0.957	0.227	606	0.881	0.338	75	0.949	0.242	681
% HD Kt/V over 1.2	94.576	4.527	623	88.373	18.037	75	93.910	7.518	698
% Adult has Fistula	69.120	8.935	625	61.165	12.747	79	68.227	9.758	704
% Adults Catheter over 90 Days	10.994	5.528	625	17.367	8.042	79	11.709	6.193	704
% Adults with hypercalcemia	1.488	1.957	631	2.560	5.076	75	1.602	2.497	706

Table 5: Summary Statistics of Key Control Variables

	Mean	Std.Dev.	Min	Median	Max	Obs
% People Age 65 15 Mins	0.15	0.04	0.09	0.14	0.63	738
% People Age 65 20 Mins	0.15	0.03	0.10	0.14	0.27	738
% People Age 65 25 Mins	0.15	0.02	0.11	0.14	0.26	738
% People with Public Health Insurance in 15 Mins	0.35	0.08	0.18	0.35	0.63	738
% People with Public Health Insurance in 20 Mins	0.35	0.07	0.18	0.35	0.58	738
% People with Public Health Insurance in 25 Mins	0.34	0.06	0.19	0.34	0.54	738
% People with Bachelor Degree 15 Mins	0.34	0.12	0.10	0.32	0.73	738
% People with Bachelor Degree 20 Mins	0.35	0.11	0.10	0.33	0.69	738
% People with Bachelor Degree 25 Mins	0.35	0.10	0.10	0.34	0.68	738
Population in 15 Mins	144115.44	124103.98	121.00	120639.50	722132.00	738
Population in 20 Mins	279653.48	233857.04	2066.00	245885.50	1163324.00	738
Population in 25 Mins	451802.62	358903.75	3704.00	417768.00	1667078.00	738
Average Income in 15 Mins	32567.31	8191.03	18059.04	30823.12	64686.50	738
Average Income in 20 Mins	33337.59	7166.88	19675.88	32120.63	60465.93	738
Average Income in 25 Mins	33707.04	6570.18	20617.66	33016.41	61571.69	738
No. Comorbidities Conditions	5.34	0.64	2.44	5.33	9.00	692

Table 6: Rating of Dialysis Treatment on Competition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Monopoly	-0.1485 (0.108)	-0.1483 (0.109)	-0.1534 (0.113)	-0.4827*** (0.113)	-0.4855*** (0.112)	-0.4838*** (0.109)	-0.3185** (0.117)	-0.3254* (0.127)	-0.3307*** (0.116)
Hospital	-0.1242 (0.279)	-0.1244 (0.282)	-0.1354 (0.249)	-0.1903 (0.290)	-0.1799 (0.285)	-0.2066 (0.261)	-0.1104 (0.421)	-0.0996 (0.420)	-0.1258 (0.381)
No. Comorbidities Conditions	-0.2933** (0.074)	-0.2933** (0.075)	-0.3009*** (0.067)	-0.3058*** (0.063)	-0.3093*** (0.064)	-0.3198*** (0.060)	-0.2866*** (0.071)	-0.2903*** (0.070)	-0.3016*** (0.061)
Ln No. Patients		0.0009 (0.052)			-0.0432 (0.036)			-0.0421 (0.051)	
Ln No. Machines			-0.0797 (0.208)			-0.1428 (0.153)			-0.1485 (0.186)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Facility FE	No	No	No	No	No	No	No	No	No
Brand FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.314	0.314	0.315	0.319	0.320	0.321	0.310	0.310	0.312
Sample	15 Mins	15 Mins	15 Mins	20 Mins	20 Mins	20 Mins	25 Mins	25 Mins	25 Mins
Observations	651	651	651	655	655	655	655	655	655

Table 7: Rating of Dialysis Treatment on Competition of Brand Monopoly

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Brand-Monopoly	-0.0464 (0.088)	-0.1448 (0.115)	-0.1447 (0.115)	-0.1473 (0.116)	-0.2514* (0.105)	-0.5077*** (0.097)	-0.5070*** (0.099)	-0.5048*** (0.101)	-0.1421 (0.140)	-0.3101** (0.118)	-0.3131* (0.123)	-0.3162** (0.108)
Hospital	-0.1261 (0.308)	-0.1248 (0.281)	-0.1249 (0.284)	-0.1365 (0.251)	-0.1574 (0.325)	-0.1944 (0.288)	-0.1840 (0.284)	-0.2098 (0.260)	-0.1385 (0.405)	-0.1115 (0.422)	-0.1009 (0.420)	-0.1279 (0.380)
No. Comorbidities Conditions	-0.2964** (0.074)	-0.2937** (0.074)	-0.2936** (0.075)	-0.3015*** (0.068)	-0.2922*** (0.071)	-0.3044*** (0.064)	-0.3079*** (0.065)	-0.3185*** (0.061)	-0.2833** (0.074)	-0.2869** (0.072)	-0.2909*** (0.071)	-0.3024*** (0.063)
Brand-Monopoly*Same Brand		0.1530 (0.124)	0.1529 (0.127)	0.1608 (0.135)		0.4449** (0.164)	0.4525** (0.164)	0.4521** (0.163)		0.3319 (0.229)	0.3457 (0.241)	0.3540 (0.238)
Ln No. Patients		0.0004 (0.054)					-0.0409 (0.038)				-0.0434 (0.054)	
Ln No. Machines				-0.0804 (0.211)				-0.1411 (0.153)				-0.1499 (0.189)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Facility FE	No	No	No	No	No	No	No	No	No	No	No	No
Brand FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County FE	No	No	No	No	No	No	No	No	No	No	No	No
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.313	0.314	0.314	0.315	0.313	0.319	0.320	0.321	0.307	0.310	0.310	0.312
Sample	15 Mins	15 Mins	15 Mins	15 Mins	20 Mins	20 Mins	20 Mins	20 Mins	25 Mins	25 Mins	25 Mins	25 Mins
Observations	651	651	651	651	655	655	655	655	655	655	655	655

Table 8: Rating of Dialysis Treatment on Competition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Ln No.Competitors	0.0582 (0.065)	0.0623 (0.066)	0.0537 (0.072)	0.1494 (0.088)	0.1505 (0.091)	0.1378 (0.096)	0.2654*** (0.054)	0.2705*** (0.053)	0.2533** (0.069)
Hospital	-0.2001 (0.319)	-0.2035 (0.319)	-0.2111 (0.287)	-0.0888 (0.297)	-0.0896 (0.296)	-0.1033 (0.269)	-0.0365 (0.308)	-0.0385 (0.308)	-0.0513 (0.273)
No. Comorbidities Conditions	-0.2781*** (0.068)	-0.2757*** (0.068)	-0.2851*** (0.057)	-0.2948*** (0.070)	-0.2945*** (0.069)	-0.3054*** (0.061)	-0.2834*** (0.069)	-0.2817*** (0.068)	-0.2914*** (0.060)
Ln No.Patients		0.0274 (0.062)			0.0041 (0.043)			0.0189 (0.043)	
Ln No. Machines			-0.0674 (0.228)			-0.1085 (0.174)			-0.0789 (0.182)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Facility FE	No	No	No	No	No	No	No	No	No
Brand FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.301	0.302	0.302	0.314	0.314	0.315	0.317	0.317	0.317
Sample	15 Mins	15 Mins	15 Mins	20 Mins	20 Mins	20 Mins	25 Mins	25 Mins	25 Mins
Observations	655	655	655	655	655	655	655	655	655

Table 9: Rating of Dialysis Treatment on Competition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Ln No.Competitors	-0.0320 (0.063)	-0.0830 (0.079)	-0.0809 (0.078)	-0.0879 (0.083)	0.0105 (0.079)	-0.0110 (0.090)	-0.0125 (0.090)	-0.0219 (0.097)	0.0106 (0.088)	0.0024 (0.089)	-0.0009 (0.096)	-0.0108 (0.104)
Hospital	-0.2365 (0.376)	-0.2943 (0.393)	-0.2958 (0.395)	-0.3072 (0.360)	-0.1154 (0.350)	-0.2050 (0.366)	-0.2034 (0.366)	-0.2226 (0.331)	-0.1533 (0.377)	-0.2845 (0.409)	-0.2830 (0.412)	-0.3036 (0.367)
No. Comorbidities Conditions	-0.2854*** (0.065)	-0.2736** (0.082)	-0.2724** (0.082)	-0.2817** (0.073)	-0.2939*** (0.068)	-0.2892** (0.083)	-0.2898** (0.084)	-0.3022** (0.075)	-0.2855** (0.075)	-0.2655** (0.086)	-0.2667** (0.086)	-0.2770** (0.081)
Ln No. Same Brand	0.2806** (0.085)	0.2811** (0.086)	0.2792** (0.084)	0.2792** (0.084)	0.2537* (0.105)	0.2537* (0.105)	0.2530* (0.107)	0.2517* (0.101)	0.3582** (0.094)	0.3577** (0.094)	0.3577** (0.094)	0.3551** (0.089)
Ln No. Patients		0.0128 (0.060)					-0.0076 (0.049)				-0.0130 (0.054)	
Ln No. Machines				-0.0784 (0.217)				-0.1319 (0.171)				-0.1131 (0.179)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Facility FE	No	No	No	No	No	No	No	No	No	No	No	No
Brand FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.301	0.320	0.320	0.321	0.309	0.326	0.326	0.327	0.306	0.340	0.340	0.342
Sample	15 Mins	15 Mins	15 Mins	15 Mins	20 Mins	20 Mins	20 Mins	20 Mins	25 Mins	25 Mins	25 Mins	25 Mins
Observations	655	655	655	655	655	655	655	655	655	655	655	655

Table 10: Rating of Dialysis Treatment on Competition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Rate of Overlap	-0.0274 (0.028)	-0.0285 (0.028)	-0.0311 (0.031)	-0.0013 (0.021)	-0.0041 (0.021)	-0.0052 (0.024)	0.0111 (0.011)	0.0105 (0.011)	0.0087 (0.013)
Hospital	-0.2166 (0.392)	-0.2136 (0.401)	-0.2310 (0.361)	-0.1190 (0.357)	-0.1090 (0.360)	-0.1371 (0.318)	-0.1449 (0.377)	-0.1427 (0.381)	-0.1624 (0.335)
No. Comorbidities Conditions	-0.2851*** (0.064)	-0.2863*** (0.062)	-0.2961*** (0.054)	-0.2939*** (0.067)	-0.2976*** (0.064)	-0.3088*** (0.057)	-0.2838** (0.075)	-0.2851** (0.072)	-0.2966*** (0.061)
Ln No. Patients		-0.0151 (0.066)			-0.0438 (0.043)			-0.0131 (0.055)	
Ln No. Machines			-0.1091 (0.233)			-0.1488 (0.199)			-0.1236 (0.208)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Facility FE	No	No	No	No	No	No	No	No	No
Brand FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.302	0.302	0.303	0.309	0.310	0.311	0.307	0.307	0.308
Sample	15 Miles	15 Miles	15 Miles	20 Miles	20 Miles	20 Miles	25 Miles	25 Miles	25 Miles
Observations	655	655	655	655	655	655	655	655	655



Table 11: Rating of Dialysis Treatment on Competition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Rate of Overlapped	-0.0616 (0.038)	-0.0720 (0.039)	-0.0724 (0.040)	-0.0745 (0.042)	-0.0237 (0.029)	-0.0238 (0.028)	-0.0256 (0.028)	-0.0275 (0.030)	-0.0110 (0.017)	-0.0073 (0.015)	-0.0082 (0.015)	-0.0102 (0.017)
Hospital	-0.2118 (0.419)	-0.2167 (0.439)	-0.2157 (0.447)	-0.2279 (0.411)	-0.1333 (0.369)	-0.1709 (0.399)	-0.1640 (0.401)	-0.1881 (0.363)	-0.1794 (0.390)	-0.2373 (0.430)	-0.2343 (0.433)	-0.2571 (0.390)
No. Comorbidities Conditions	-0.2839*** (0.063)	-0.2714** (0.072)	-0.2718** (0.070)	-0.2801*** (0.065)	-0.2929*** (0.067)	-0.2804** (0.082)	-0.2829** (0.081)	-0.2947*** (0.072)	-0.2848** (0.074)	-0.2651** (0.089)	-0.2668** (0.087)	-0.2790** (0.078)
Rate of Overlapped Same Brand	0.2029** (0.074)	0.2029** (0.074)	0.2024** (0.075)	0.1976** (0.068)	0.1299* (0.052)	0.1299* (0.052)	0.1274* (0.052)	0.1255** (0.046)	0.1044** (0.040)	0.1036** (0.040)	0.1036** (0.040)	0.1025** (0.037)
Ln No. Patients												
Ln No. Machines				-0.0850 (0.211)				-0.1432 (0.170)				-0.1351 (0.173)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Facility FE	No	No	No	No	No	No	No	No	No	No	No	No
Brand FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.308	0.321	0.321	0.322	0.312	0.325	0.325	0.327	0.307	0.325	0.325	0.326
Sample	15 Miles	15 Miles	15 Miles	15 Miles	20 Miles	20 Miles	20 Miles	20 Miles	25 Miles	25 Miles	25 Miles	25 Miles
Observations	655	655	655	655	655	655	655	655	655	655	655	655

## 6.1 Appendix

Table 12: Rating of Dialysis Treatment on Competition (Market is defined by County)

	(1)	(2)	(3)
	Rating	Rating	Rating
HHI	0.4800 (0.647)	0.4268 (0.609)	0.4808 (0.644)
Hospital	-1.1273*** (0.119)	-1.5131** (0.472)	-1.1112*** (0.252)
No. Comorbidities Conditions	-0.3541** (0.108)	-0.3627** (0.106)	-0.3541** (0.109)
Ln No. Patients		-0.5446 (0.579)	
Ln No. Machines			0.0379 (0.438)
Year FE	Yes	Yes	Yes
Facility FE	Yes	Yes	Yes
Brand FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes
R-sq	0.722	0.725	0.722
Sample	Mins	Mins	Mins
Observations	655	655	655

Table 13: Rating of Dialysis Treatment on Competition (Market is defined by County)

	(1)	(2)	(3)
	Rating	Rating	Rating
HHI Last Year	-1.0714*** (0.200)	-1.0387*** (0.256)	-1.0717*** (0.197)
Hospital	-1.1096*** (0.115)	-1.4782** (0.464)	-1.1193*** (0.243)
No. Comorbidities Conditions	-0.3394** (0.118)	-0.3481** (0.114)	-0.3393** (0.118)
Ln No. Patients		-0.5196 (0.574)	
Ln No. Machines			-0.0226 (0.429)
Year FE	Yes	Yes	Yes
Facility FE	Yes	Yes	Yes
Brand FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes
R-sq	0.726	0.728	0.726
Sample	Mins	Mins	Mins
Observations	655	655	655

Table 14: Rating of Dialysis Treatment on Competition (Market is defined by County)

	(1)	(2)	(3)
	Rating	Rating	Rating
Monopoly in a County	0.1935** (0.056)	0.2088*** (0.051)	0.1936** (0.057)
Hospital	-1.1270*** (0.120)	-1.5178** (0.471)	-1.1143*** (0.254)
No. Comorbidities Conditions	-0.3535** (0.108)	-0.3623** (0.106)	-0.3536** (0.109)
Ln No. Patients		-0.5520 (0.579)	
Ln No. Machines			0.0298 (0.443)
Year FE	Yes	Yes	Yes
Facility FE	Yes	Yes	Yes
Brand FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes
R-sq	0.722	0.724	0.722
Sample	Mins	Mins	Mins
Observations	655	655	655

Table 15: Rating of Dialysis Treatment on Competition (Market is defined by County)

	(1)	(2)	(3)
	Rating	Rating	Rating
No. Competitors in County	-0.1574** (0.050)	-0.1559** (0.048)	-0.1574** (0.050)
Hospital	-1.1379*** (0.086)	-1.5221** (0.453)	-1.1223*** (0.243)
No. Comorbidities Conditions	-0.3508** (0.108)	-0.3594** (0.105)	-0.3508** (0.108)
Ln No. Patients		-0.5426 (0.572)	
Ln No. Machines			0.0367 (0.440)
Year FE	Yes	Yes	Yes
Facility FE	Yes	Yes	Yes
Brand FE	Yes	Yes	Yes
County FE	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes
R-sq	0.725	0.727	0.725
Sample	Mins	Mins	Mins
Observations	655	655	655

Table 16: Rating of Dialysis Treatment on Competition (Market is defined by County)

	(1)	(2)	(3)
	Rating	Rating	Rating
Ln Number of Competitors	-1.4785** (0.613)	-1.6989** (0.764)	-1.4824** (0.518)
Ln Number of the Same Brand	0.0731 (0.446)	0.2438 (0.535)	0.0776 (0.175)
Hospital	-1.1982*** (0.136)	-1.7023*** (0.420)	-1.2530*** (0.298)
No. Comorbidities Conditions	-0.3533*** (0.098)	-0.4084*** (0.109)	-0.3531** (0.103)
Ln No. Patients		-0.7529 (0.513)	
Ln No. Machines			-0.1258 (0.455)
Year FE	Yes	Yes	Yes
Facility FE	Yes	Yes	Yes
Brand FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes
R-sq	0.728	0.729	0.728
Sample	Mins	Mins	Mins
Observations	655	536	655

Table 17: Summary Statistics to Closest Facility from Zip Code

	0			1			Total					
	Mean	Std.Dev.	Obs	Mean	Std.Dev.	Obs	Mean	Std.Dev.	Obs			
Driving Distance to Closest Facility	8.343	6.444	3436	7.050	7.050	3936	18.563	8.624	2892			
Driving Distance to Second Closest Facility	12.107	7.591	6201	11.118	16.955	3812	26.580	7.786	1632			
Driving Distance to Third Closest Facility	14.980	8.471	7963	14.269	21.217	3678	28.110	7.980	715			
				Median	75 Percentile	Obs	Median	75 Percentile	Obs	Median	75 Percentile	Obs
				3.436	11.674	3936	18.033	24.811	2892	5.324	18.428	6828
				6.201	16.955	3812	26.362	31.139	1632	8.201	23.751	5444
				7.963	21.217	3678	27.595	31.526	715	9.160	24.213	4393

Table 18: Rating of Dialysis Treatment on Competition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Monopoly	-0.1532 (0.242)	-0.1592 (0.238)	-0.1415 (0.227)	0.0588 (0.128)	0.0654 (0.131)	0.0730 (0.134)	-0.1609 (0.200)	-0.1517 (0.206)	-0.1589 (0.197)
Hospital	-0.1665 (0.319)	-0.1718 (0.319)	-0.1758 (0.297)	-0.1806 (0.381)	-0.1718 (0.383)	-0.2000 (0.347)	-0.1867 (0.380)	-0.1773 (0.389)	-0.2054 (0.345)
No. Comorbidities Conditions	-0.3172*** (0.062)	-0.3157*** (0.064)	-0.3241*** (0.060)	-0.3193*** (0.072)	-0.3220*** (0.073)	-0.3344*** (0.062)	-0.3012*** (0.073)	-0.3039*** (0.072)	-0.3156*** (0.063)
Ln No. Patients	0.0229 (0.052)				-0.0346 (0.058)			-0.0380 (0.058)	
Ln No. Machines			-0.0780 (0.196)			-0.1524 (0.181)			-0.1505 (0.206)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Facility FE	No	No	No	No	No	No	No	No	No
Brand FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.318	0.318	0.318	0.307	0.307	0.310	0.305	0.306	0.308
Sample	7 Miles	7 Miles	7 Miles	9 Miles	9 Miles	9 Miles	11 Miles	11 Miles	11 Miles
Observations	655	655	655	655	655	655	655	655	655



Table 19: Rating of Dialysis Treatment on Competition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Monopoly	0.0371 (0.142)	-0.0869 (0.246)	-0.0878 (0.247)	-0.0623 (0.221)	0.0884 (0.096)	0.0961 (0.133)	0.1160 (0.148)	0.1267 (0.136)	0.1148 (0.102)	-0.0841 (0.189)	-0.0580 (0.198)	-0.0670 (0.197)
Hospital	-0.1498 (0.354)	-0.1581 (0.322)	-0.1587 (0.325)	-0.1696 (0.301)	-0.1764 (0.361)	-0.1779 (0.375)	-0.1642 (0.376)	-0.1985 (0.338)	-0.2066 (0.358)	-0.1912 (0.357)	-0.1761 (0.361)	-0.2142 (0.315)
No. Comorbidities Conditions	-0.3190*** (0.064)	-0.3229*** (0.061)	-0.3227*** (0.063)	-0.3329*** (0.060)	-0.3204*** (0.069)	-0.3205*** (0.070)	-0.3249*** (0.071)	-0.3378*** (0.060)	-0.3060*** (0.074)	-0.3117*** (0.074)	-0.3178*** (0.073)	-0.3308*** (0.068)
Monopoly*Same Brand	0.2554 (0.183)	0.2554 (0.183)	0.2554 (0.183)	0.2531 (0.185)	0.2531 (0.185)	-0.0117 (0.127)	-0.0089 (0.130)	-0.0087 (0.149)	0.2750 (0.244)	0.2750 (0.244)	0.2752 (0.248)	0.2943 (0.230)
Ln No. Patients		0.0021 (0.060)					-0.0517 (0.075)				-0.0638 (0.056)	
Ln No. Machines				-0.1051 (0.211)				-0.1700 (0.197)				-0.1784 (0.211)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Facility FE	No	No	No	No	No	No	No	No	No	No	No	No
Brand FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County FE	No	No	No	No	No	No	No	No	No	No	No	No
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.316	0.319	0.319	0.320	0.308	0.308	0.308	0.311	0.305	0.308	0.308	0.311
Sample	7 Miles	7 Miles	7 Miles	7 Miles	9 Miles	9 Miles	9 Miles	9 Miles	11 Miles	11 Miles	11 Miles	11 Miles
Observations	655	655	655	655	655	655	655	655	655	655	655	655

Table 20: Rating of Dialysis Treatment on Competition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Ln No. Competitors	-0.0537 (0.096)	-0.0628 (0.100)	-0.0845 (0.105)	0.0048 (0.088)	-0.0098 (0.092)	-0.0233 (0.104)	0.1291 (0.104)	0.1321 (0.126)	0.1095 (0.139)
Hospital	-0.1598 (0.385)	-0.1559 (0.393)	-0.1825 (0.357)	-0.1703 (0.364)	-0.1651 (0.369)	-0.1975 (0.321)	-0.1427 (0.333)	-0.1433 (0.339)	-0.1653 (0.281)
No. Comorbidities Conditions	-0.3182*** (0.062)	-0.3198*** (0.062)	-0.3310*** (0.055)	-0.3183*** (0.069)	-0.3214*** (0.067)	-0.3344*** (0.056)	-0.2963*** (0.073)	-0.2957*** (0.069)	-0.3079*** (0.060)
Ln No. Patients		-0.0234 (0.057)			-0.0356 (0.055)			0.0071 (0.081)	
Ln No. Machines			-0.1436 (0.228)			-0.1580 (0.212)			-0.1145 (0.241)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Facility FE	No	No	No	No	No	No	No	No	No
Brand FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.317	0.317	0.318	0.307	0.307	0.309	0.308	0.308	0.309
Sample	7 Miles	7 Miles	7 Miles	9 Miles	9 Miles	9 Miles	11 Miles	11 Miles	11 Miles
Observations	655	655	655	655	655	655	655	655	655

Table 21: Rating of Dialysis Treatment on Competition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Ln No.Competitors	-0.1379 (0.084)	-0.1811* (0.084)	-0.1927* (0.084)	-0.1994* (0.081)	-0.0883 (0.093)	-0.1268 (0.095)	-0.1526 (0.102)	-0.1506 (0.108)	-0.0341 (0.094)	-0.0689 (0.081)	-0.0761 (0.092)	-0.0837 (0.102)
Hospital	-0.1722 (0.418)	-0.1923 (0.445)	-0.1861 (0.458)	-0.2098 (0.414)	-0.2032 (0.371)	-0.2668 (0.386)	-0.2550 (0.393)	-0.2919 (0.344)	-0.2140 (0.347)	-0.2668 (0.391)	-0.2636 (0.398)	-0.2882 (0.345)
No. Comorbidities Conditions	-0.3162*** (0.059)	-0.3079*** (0.064)	-0.3102*** (0.064)	-0.3185*** (0.064)	-0.3198*** (0.068)	-0.3081** (0.077)	-0.3141*** (0.075)	-0.3249*** (0.066)	-0.3012*** (0.071)	-0.2880** (0.089)	-0.2900** (0.086)	-0.3009** (0.078)
Ln No. Same Brand	0.2671** (0.086)	0.2622** (0.088)	0.2524** (0.087)	0.2524** (0.087)	0.2952** (0.108)	0.3014** (0.112)	0.2952** (0.108)	0.2899** (0.099)	0.3507*** (0.095)	0.3535** (0.100)	0.3507*** (0.095)	0.3457** (0.087)
Ln No. Patients												
Ln No. Machines				-0.1191 (0.230)				-0.1639 (0.207)				-0.1265 (0.223)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Facility FE	No	No	No	No	No	No	No	No	No	No	No	No
Brand FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.322	0.335	0.335	0.336	0.309	0.326	0.327	0.329	0.305	0.331	0.331	0.332
Sample	7 Miles	7 Miles	7 Miles	7 Miles	9 Miles	9 Miles	9 Miles	9 Miles	11 Miles	11 Miles	11 Miles	11 Miles
Observations	655	655	655	655	655	655	655	655	655	655	655	655

Table 22: Rating of Dialysis Treatment on Competition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Rate of Overlapped	-0.0741 (0.037)	-0.0873* (0.039)	-0.0884* (0.039)	-0.0940* (0.042)	-0.0558 (0.038)	-0.0564 (0.034)	-0.0604 (0.034)	-0.0618 (0.035)	-0.0336 (0.031)	-0.0280 (0.027)	-0.0303 (0.028)	-0.0316 (0.028)
Hospital	-0.1063 (0.381)	-0.1063 (0.412)	-0.1028 (0.426)	-0.1186 (0.387)	-0.1538 (0.376)	-0.1883 (0.401)	-0.1731 (0.407)	-0.2026 (0.368)	-0.2123 (0.385)	-0.2330 (0.425)	-0.2251 (0.436)	-0.2507 (0.388)
No. Comorbidities Conditions	-0.3040*** (0.067)	-0.3013*** (0.068)	-0.3019*** (0.068)	-0.3112*** (0.065)	-0.3112*** (0.070)	-0.3046*** (0.073)	-0.3076*** (0.072)	-0.3196*** (0.064)	-0.2972*** (0.073)	-0.2840** (0.080)	-0.2865** (0.077)	-0.2975*** (0.068)
Rate of Overlapped Same Brand		0.2796 (0.145)	0.2775 (0.141)	0.2668* (0.130)		0.2170 (0.111)	0.2091 (0.112)	0.2056* (0.101)	0.2003** (0.076)	0.1963*** (0.071)	0.1933** (0.071)	0.1933** (0.065)
Ln No. Patients			-0.0128 (0.058)				-0.0449 (0.044)				-0.0318 (0.056)	
Ln No. Machines				-0.1283 (0.200)				-0.1579 (0.178)				-0.1382 (0.199)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Facility FE	No	No	No	No	No	No	No	No	No	No	No	No
Brand FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.325	0.339	0.339	0.341	0.314	0.328	0.328	0.330	0.308	0.326	0.326	0.328
Sample	7 Miles	7 Miles	7 Miles	7 Miles	9 Miles	9 Miles	9 Miles	9 Miles	11 Miles	11 Miles	11 Miles	11 Miles
Observations	655	655	655	655	655	655	655	655	655	655	655	655

Table 23: Rating of Dialysis Treatment on Competition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Rate of Overlapped	-0.0741 (0.037)	-0.0873* (0.039)	-0.0884* (0.039)	-0.0940* (0.042)	-0.0558 (0.038)	-0.0564 (0.034)	-0.0604 (0.034)	-0.0618 (0.035)	-0.0336 (0.031)	-0.0280 (0.027)	-0.0303 (0.028)	-0.0316 (0.028)
Hospital	-0.1063 (0.381)	-0.1063 (0.412)	-0.1028 (0.426)	-0.1186 (0.387)	-0.1538 (0.376)	-0.1883 (0.401)	-0.1731 (0.407)	-0.2026 (0.368)	-0.2123 (0.385)	-0.2330 (0.425)	-0.2251 (0.436)	-0.2507 (0.388)
No. Comorbidities Conditions	-0.3040*** (0.067)	-0.3013*** (0.068)	-0.3019*** (0.068)	-0.3112*** (0.065)	-0.3112*** (0.070)	-0.3046*** (0.073)	-0.3076*** (0.072)	-0.3196*** (0.064)	-0.2972*** (0.073)	-0.2840** (0.080)	-0.2865** (0.077)	-0.2975*** (0.068)
Rate of Overlapped Same Brand		0.2796 (0.145)	0.2775 (0.141)	0.2668* (0.130)		0.2170 (0.111)	0.2091 (0.112)	0.2056* (0.101)	0.2003** (0.076)	0.1963*** (0.071)	0.1933** (0.071)	0.1933** (0.065)
Ln No. Patients			-0.0128 (0.058)				-0.0449 (0.044)				-0.0318 (0.056)	
Ln No. Machines				-0.1283 (0.200)				-0.1579 (0.178)				-0.1382 (0.199)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Facility FE	No	No	No	No	No	No	No	No	No	No	No	No
Brand FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.325	0.339	0.339	0.341	0.314	0.328	0.328	0.330	0.308	0.326	0.326	0.328
Sample	7 Miles	7 Miles	7 Miles	7 Miles	9 Miles	9 Miles	9 Miles	9 Miles	11 Miles	11 Miles	11 Miles	11 Miles
Observations	655	655	655	655	655	655	655	655	655	655	655	655