CAPITATION AND CONSOLIDATION: HOW ARE NEW REIMBURSMENT POLICIES AFFECTING THE DIALYSIS MARKET AND WHAT DOES THIS MEAN FOR OTHER HEALTHCARE MARKETS

AN HONORS THESIS

SUBMITTED ON THE 6 DAY OF MAY, 2022

TO THE DEPARTMENT OF PUBLIC HEALTH

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

OF THE HONORS PROGRAM

OF NEWCOMB-TULANE COLLEGE

TULANE UNIVERSITY

FOR THE DEGREE OF

BACHELOR OF SCIENCE WITH HONORS IN PUBLIC HEALTH

BY

Ilana Segal

Ilana Segal

APPROVED:

Dr. Kevin Callison
Director of Thesis

Dr. Charles Stoecker
Second Reader

Prof. Toni Weiss
Third Reader

Abstract

This thesis analyzes how a change in reimbursement model from Fee-For-Service (FFS) to a bundled payment model affects firm sizes in the dialysis market from 2007 to 2020. This work aims to provide context as to how bundled payment and other capitation policies may affect healthcare markets in unexpected ways. This thesis will assess the state of the dialysis market through a comparison of its current state to perfect competition economic principles. The Background section will provide readers with an overview of the dialysis industry as well as recent policy changes in the dialysis reimbursement. The Methods section describes why a comparative interrupted time series analysis (CITSA) was chosen, and explains all variables and analyses utilized to produce a picture of the dialysis markets changes over time, using number of facilities owned by two different categories of firms annually. The Results section reports average changes in facility ownership by firm grouping over in both the pre and post-treatment periods, and examines the differences in the trends of both groups, concluding that significant consolidation has taken place in the dialysis market. The Discussion interprets the results of the analysis and expands on recent trends of capitation and consolidation in healthcare markets. The Conclusion of this research gives recommendation for future research and policy that could be crucial to protect Americans from rising healthcare prices and unnecessary care costs, given the rates of consolidation in healthcare and the amount of markets that are already highly concentrated.

Acknowledgements

This project would not have been possible without the help, guidance, and support I received from Dr. Kevin Callison, who helped me turn my idea into a tangible research question, and taught me many invaluable skills throughout the writing process. His mentorship has allowed me to build my academic writing skills, learn to use the Stata software, and understand my research methods in depth. I am extremely grateful for all of the guidance I received from Dr. Callison throughout the year.

I would also like to thank my second and third readers, Dr. Charles Stoecker and Prof. Toni Weiss for serving as members of my thesis committee. Dr. Stoecker pushed me out of my comfort zone, allowing me to grow as a student and inspiring me to continue to pursue my academic curiosities. I would like to extend a very special thanks to Prof. Weiss for joining my thesis committee last minute, and offering her support and calming presence at my thesis defense with very little notice.

Additionally, I would like to extend my thanks to the Honors Department, with a special thanks to Trina Beck, who offered me thoughtful words of encouragement and assistance as I navigated the final weeks of the thesis writing process. Finally, I would like to thank my friends and family for their support and encouragement throughout the year. Thank you all for believing in me when I doubted myself.

Table of Contents

List of Tables and Figures

Introduction:

In 2007, the Centers for Medicare and Medicaid Services (CMS) announced a policy that would be implemented in 2011 that would transition dialysis to being reimbursed through the Prospective Payment System (PPS), a capitated reimbursement model. Many experts and policymakers believe that any movement away from Fee-For-Service (FFS) reimbursement models will be an effective strategy at reducing healthcare costs (Burns & Pauly, 2018). However, the unintended consequences of these policies, such as firm Mergers and Acquisitions are somewhat unexplored. As capitated reimbursement models become increasingly popular, it is important to understand how these policies will both intentionally and unintentionally affect not only healthcare costs, but health outcomes and healthcare markets as well. This thesis analyzes how the new capitated policy affects the number and size of firms in the dialysis market and discusses the potential implications that these unintended consequences may have on healthcare markets and prices in the future.

a) Research Design

The dialysis market is unique in that two for-profit large chain firms dominate the market makeup, with the rest of the market being made up of smaller chains, or independent firms. In 2007, when the policy was announced, these two firms made up approximately 50 percent of the dialysis market (Pollack, 2007). These market conditions allow this research to conduct a comparison of how large chain firms versus small firms fare in the post-policy period. Using dialysis facility compare data from CMS, this thesis will conduct a comparative interrupted time series analysis (CITSA) to determine how the capitated policy impacted the makeup of the dialysis market. From the data, each

provider number and chain organization will be used to sort each facility into one of two groups, large chain and small firm. CMS collects dialysis facility compare data annually, allowing this research to track changes in the dialysis market over time.

One theory is that large firms may be financially able to persist through revenue shocks caused by the new policy (Sloan et al., 2021). In this case, this research would expect to see closures from small firm dialysis centers. Another theory is that large chain firms may fare better in the wake of the new policy, causing them to acquire small firms (Sloan et al., 2021). If this were the case, this research would expect to find growing numbers of large chain firms and decreasing numbers of small firms simultaneously. Sloan et al., found a significant increase in the odds of acquisition following the implementation of the PPS, supporting the second hypothesis listed above (2021). This research aims to provide context to the impacts of the policy implementation on the size and number of firms in the dialysis market, as well as a discussion of the effects of increased consolidation in healthcare markets.

While this thesis aims to document the effects of changing dialysis reimbursement methods on the dialysis market, there are other policies that potentially influence the dialysis market as well. Most notably, the dialysis Quality Incentive Program (QIP), implemented as a pay for performance program, was implemented in 2012 to link quality of care to reimbursement amount (CMS, 2022). Because the two policies were implemented in such close proximity, it is difficult to separate the effects that each may have had on the dialysis market makeup.

b) Policy Implications and Findings Summary

This research aims to provide context so that the intended and unintended effects of capitated reimbursement policies can be better understood and effective policy can be implemented in the future. One unintended consequence of capitated reimbursement models may be increased Mergers and Acquisitions (M&A) in healthcare markets (Lineen, 2014). This consolidation can become problematic if one or few firms gain control of the market, ultimately driving up prices in oligopolistic conditions. M&A activity can also lead to violation of antitrust law in some cases (Areeda & Hovenkamp, 2011). It is important to document these effects so that future policy can be implemented in a way that avoids these unintended consequences. Additionally, the effects of the dialysis QIP are of interest to policy makers, as it is the first mandatory federal pay-for-performance program (Weiner & Watnick, 2017).

This research predicts that larger dialysis providers may be able to fair better in the wake of the PPS for a few reasons. For one, larger dialysis facilities may be able to negotiate higher prices with suppliers due to their increased market share, thus padding the financial shock they will receive due to the policy implementation (Saeed et al., 2020; Kaplan & Haas, 2014). Additionally, it is likely that larger dialysis providers may increase the use of services that are not included in the PPS to help increase their profit margins. This is a form of supplier induced demand that has been well documented in the two largest dialysis providers, Davita and Fresenius (Thamer et al., 2007). Large dialysis providers, Davita and Fresenius, may also have lower staffing costs as empirical evidence suggests they strategically hire less skilled workers and have higher staff to patient ratios (Eliason et al., 2020). If large dialysis providers are able to shield themselves from the

financial shock of the PPS, they may be in an advantageous position to acquire smaller dialysis firms.

This research concluded that the trends in large chain firms and small firms are diverging significantly since the implementation of the PPS. Although similar trends existed before the implementation of the PPS, statistical analysis found that following the policy implementation, these trends were exacerbated. Thus, this research has found that the implementation of the PPS had a statistically significant impact on consolidation in the dialysis industry. These findings show an unintended consequence of prospective payments and can provide vital information on how similar capitated policies may affect healthcare markets in future policy.

Background:

a) Overview of the Dialysis Industry:

Developed in 1965 by President Lydon Johnson, The Medicare and Medicaid Act established the first public insurance programs in the United States. Medicare was structured as a health insurance program for the elderly while Medicaid was health insurance for the poor. In 2020, Medicare alone accounted for 12 percent of the United States budget, costing the country $776 billion. Under current law is projected to account for 20 percent of the United States budget by 2051 (Peter G. Peterson Foundation, 2021). Additionally, 18 percent of the total U.S. population currently receives health insurance through Medicare (KFF, 2019). Neuman et al. predicts that between 2010 and 2050, the United States population ages 65 and older will nearly double (2015). As increased numbers of aging individuals gain coverage through Medicare, effective policy

interventions that aim to cut costs will be crucial to maintaining the solvency of the Medicare program.

In 1972, President Nixon signed into law the National End Stage Renal Disease (ESRD) Program which extended Medicare benefits to those suffering from the disease. This program was established in response to the extremely high costs borne by individuals with ESRD. This program allows for near-universal coverage for patients who require dialysis treatment, the only treatment option for an ESRD patient while they wait for a kidney transplant. Dialysis is a costly form of care that must be given at least three times per week, and performs the function of a kidney for patients by filtering extra water, toxins, and solutes from the blood. While kidney transplants are regarded as the gold standard of treatment by most experts, limited supply of available kidneys leave 70 percent of ESRD patients with dialysis as their only option (Iglehart, 2011).

Notably, in 1972, healthcare spending accounted for a significantly smaller proportion of GDP than it does today–about 6 percent compared to the 2018 statistic of 18 percent (Saran et al., 2019). In 1972, analysts in the Department of Health, Education and Welfare predicted that, once in a steady state, the ESRD program would cost $1 billion in 1972 dollars, or about $6 billion in 2017 dollars (USRDS, 2017). $6 billion would have accounted for .8 percent of Medicare spending in 2017, which was about $705.9 billion (CMS, 2017). However, the actual costs of administering dialysis in 2017 accounted for 7.2 percent of all Medicare spending, although only 1.2 percent of the Medicare population required dialysis in that year (Saran et al., 2019). In 2017, there were 746,557 Americans with ESRD, and 124,500 of those cases were diagnosed in 2017 (Saran et al., 2019). These statistics show a 2.6 percent increase in the prevalence of

ESRD between 2016 and 2017, and increases in prevalence are expected in the coming years (Saran et al., 2019).

In addition to ESRD, many chronic illnesses are increasing in prevalence. Increases in hypertension and diabetes are alarming in particular because they are primary causes of ESRD, (Raghupathi & Raghupathi, 2018). In 2018, seven out of the top ten health problems in America were listed as chronic conditions. Among these, Chronic Kidney Disease (CKD), a direct precursor to ESRD, is listed as ninth out of ten (Raghupathi & Raghupathi, 2018). Increases in chronic diseases can be partially attributed to changing demographics within the United States such as increases in sedentary lifestyle and aging populations. As the burden of these chronic diseases grows within the United States, the total cost of care to treat these conditions is expected to rise as well.

In addition to rising costs, increases in prevalence require the dialysis industry to be able to handle increasing numbers of patients that need treatment. A unique feature of the dialysis industry is the number and relative size of the firms in the market. Large for-profit dialysis firms own 80 percent of the market in dialysis care (Eliason et al., 2020). In particular, the dialysis providers DaVita Kidney Care and Fresenius Medical Care made up approximately 73 percent of dialysis facilities in 2019 and earned more than 90 percent of the industry's profits in that year (Eliason et al., 2020). In 2007, there were a total of 4873 dialysis facilities compared with the 7722 dialysis facilities that made up the market in 2020. Davita Kidney Care and Fresenius Medical Care are the largest dialysis providers in the country, and only continue to grow, as there has been an increase in their combined share of the dialysis market from approximately 50 percent to

73 percent in the past ten years (Pollack, 2007). Consequently, the increases in patient capacity also provide an opportunity for dialysis firms to increase their revenue and potentially their profits as well.

These two firms provide care to the majority of dialysis patients. Therefore, it is important to contextualize how these firms behaviors affect patient outcomes. While this research was unable to conduct analysis on quality of care, the difference in behavior by firm type is well documented. In the dialysis industry, ample evidence suggests that large for-profit firms exhibit many behaviors that suggest they are more concerned with profit rather than quality of care. For one, other research has concluded that large for-profit chain facilities are less likely to refer patients to the transplant waitlist (Eliason et al., 2020; Thamer et al., 2007; Zhang et al., 2014). This behavior implies that large for-profit firms aim to keep their patients on dialysis for as long as possible, to ensure that the profit they receive on a per-patient basis is maximized. In addition to having lower rates of patients on the transplant waitlist, large for-profit firms have also been shown to have higher patient to employee ratios, and less skilled workers than their small firm counterparts (Eliason et al., 2020). Eliason et al., finds that acquired dialysis facilities are likely to replace high-skilled nurses with lower-skill technicians in order to reduce the cost of labor at those facilities. Additionally, once a facility is acquired, it is likely that the facility will increase its patient population (Eliason et al., 2020). The differences in firm behavior strongly suggest that many patients of large for-profit chains are receiving lower quality care than that of their small firm counterparts.

b) Recent Policy Changes in the Dialysis industry:

Traditionally Medicare, as well as the U.S. healthcare system have been reimbursed through a FFS model (Berenson & Rich, 2010). For every instance of care prescribed by a provider, a payor reimbursed that provider a negotiated amount. This reimbursement structure has been shown to drive up the cost of healthcare spending, as this method incentivizes increasing the quantity of care rather than the quality of care (Mechanic & Altman, 2009). As a means to cut costs, new reimbursement methods that aim to incentivize value are being introduced across the healthcare industry.

In some cases, the FFS reimbursement method is known to invoke a behavior pattern known as physician induced demand (PID) (Seyedin et al., 2021). PID occurs when a service that is generously reimbursed is unnecessarily overprescribed by providers. In the dialysis industry, there is evidence of PID in the injection of drugs known as Erythropoietin-Stimulating Agents (ESA). ESAs are used to treat anemia in ESRD patients, as the injection stimulates the body to create new red blood cells. Between the years of 1991 and 2008, Medicare spending on ESAs increased from $200 million to $2 billion, representing a 10-fold increase in spending (Swaminathan, 2014). In 2005, DaVita reported ESAs accounting for 25 percent of their revenue and upwards of 40 percent of their accounting profits (DaVita, 2005). In 2010, ESAs were the largest prescription drug expense for CMS (U.S. Government Accountability Office, 2012). Additionally, growth in administration is not associated with any increased clinical benefit, but rather the opposite. During this time period, clinical evidence that associated high ESA use with increased risk of stroke and death among some patients with ESRD was observed (Besarab et al. 1998; Brookhart et al., 2010; Singh et al., 2006).

Along with the conflicting evidence about the clinical effectiveness of ESAs, there is also evidence of variation in ESA use among different dialysis firm types. When comparing for-profit and not-for-profit dialysis facilities, administration of ESAs in for-profit firms was significantly higher than the not-for-profit counterparts regardless of anemia status (Thamer et al., 2007). The greatest difference in ESA use was observed between large for-profit chain facilities and not-for-profit facilities, with large for-profit firms showing the highest use of ESAs, and not-for-profit firms showing the lowest administration (Thamer et al., 2007). The variation in ESA use is evidence of PID in the dialysis market, and this unnecessary care is encouraged through the FFS reimbursement model.

One policy intervention aimed at reducing PID and overall healthcare costs is changing the reimbursement structure from a FFS model to a model known as capitation. Capitation shifts the financial risk from the payor to the provider by providing a lump sum payment for each patient or condition rather than reimbursing every instance of care. This form of reimbursement does not financially reward quantity, but instead awards providers who can lower the cost required to treat their patients, allowing the provider to keep the remaining capitated payment as profit. In 2007, the Centers for Medicare and Medicaid Services (CMS) announced a policy that would be implemented in 2011 that would transition dialysis to being reimbursed through the Prospective Payment System (PPS), a capitated reimbursement model. The PPS reimburses providers a predetermined amount for some episode of care annually. Specifically, this policy bundles ESAs for dialysis facilities, meaning dialysis facilities will receive a set amount to administer ESAs for an entire year. The goal of this policy is to reduce unnecessary Medicare expenditures

related to dialysis. In response to the policy implementation, researchers found that there was, in fact, a significant reduction in ESA use (Swaminathan et al., 2014). The policy response also included an increase in lower cost treatments such as iron products to replace ESAs, and resulted in an overall decrease in drug spending of $25 per dialysis treatment (Hirth, 2013).

While the change in reimbursement method was associated with a reduction in costs, the effects on patient outcomes remained unclear. There was some thought that perhaps the decrease in ESA use could adversely affect patient outcomes (Swaminathan et al., 2014). To prevent this, CMS introduced the first mandatory federal pay for performance program in 2012 in addition to the change in reimbursement methods for dialysis. This pay for performance program is titled the ESRD Quality Incentive Program (QIP). Through the QIP, dialysis facilities are given a one to five star rating based on certain quality metrics established by CMS. The one to five star rating is then associated with a reduction of payments to dialysis facilities of up to 2 percent. These metrics are updated annually, and are subject to the federal rulemaking process. In 2012, two clinical metrics were used to assess the quality of dialysis facilities. Over the years, these metrics have become more robust. In 2017, 8 clinical measures and 3 reporting measures were used to assess the quality of each dialysis facility. One of the metrics included in the dialysis QIP is anemia management. This metric is included to prevent the bundling of ESA payments from reducing ESA use to a point where patient outcomes were negatively affected (Wetmore, 2016).

While the effects of these policies on ESA use is well established, what is unknown is the effect of these policies on the Dialysis industry as a whole. Because of

the dominating nature of large chain for-profit dialysis firms, small chain and independent dialysis firms may be adversely affected by these new policies. More specifically, if small chain and independent dialysis firms faced significant financial shocks as a result of these policies, they could either face acquisition or closure. Anecdotally, one independent dialysis firm predicted that as a result of the new PPS reimbursement policy, they will lose as much as $118,000 in annual revenue (Bhat et al., 2009).

Large chain for-profit dialysis firms are predicted to navigate anticipated financial shocks more efficiently for a number of reasons. For one large chain firms may be able to negotiate lower rates with suppliers due to their increased market share (Kaplan & Haas, 2014). Davita and Fresenius have owned a combined market share above 50 percent since 2010, thus allowing them to negotiate with suppliers. This practice has been documented in both the dialysis market as well as other healthcare markets (Saeed et al., 2020; Kaplan & Haas, 2014). Another practice that can help shield large chain firms from financial shocks in increases in services that are not covered under the proposed bundled payment, but rather still reimbursed through a FFS method. This may include labs relating to transplantation and other lab tests ordered by a physician that are unrelated to dialysis, both of which are not included in the bundle (CMS, 2022). PID for these services in response to the bundle may help increase revenues, as large chain firms have been documented utilizing these practices before(Swaminathan et al., 2014). However, these labs may be necessary in the event that patients are experiencing other chronic conditions along with ESRD. Often times, patients with ESRD are suffering from multiple chronic illnesses that may require lab work (U.S. Department of Health and Human Services,

2021). Additionally, ESRD may lead to other medical conditions that require routine lab work (U.S. Department of Health and Human Services, 2021). It is not uncommon that patients undergo lab tests during their dialysis treatment (Davita, 2022). Finally, large firm dialysis providers often hire less skilled workers than their small firm counterparts, and have hire staff to patient ratios (Eliason et al., 2020). Wages for high-skilled workers are often higher than their less skilled counterparts. If large chain dialysis firms have reduced staffing costs, they may be able to navigate financial shocks with more efficiency. Overall, these practices may help larger firms resist financial shocks, putting them in an advantageous position to acquire smaller firms.

Mergers and acquisitions (M&A) are an increasing phenomenon in healthcare, as larger firms often have increased bargaining powers, and can drive up prices. One study found that independent dialysis facilities faced an increase in likelihood of acquisition by 3.48 higher odds post PPS implementation in 2011 (Sloan et al., 2021). The same study found no significant changes in the likelihood of closure for independent dialysis facilities (Sloan et al., 2021). If these acquisitions are significant, the consolidation in the dialysis market could account for increased bargaining power from large chain for-profit dialysis firms, and in turn increased prices for dialysis in the long run. The effects of these policies on the current state of the dialysis market remain unclear, and further research will provide critical public health knowledge as capitated payments and pay for performance policies increase in popularity.

Methods:

a) Data and Study Population

This research utilized CMS dialysis facility compare data from 2007 to 2020. This time period was chosen so that a comprehensive depiction of the dialysis market could be shown both before and after the prospective payment policy implementation. This data is collected annually from each Medicare-certified dialysis facility nationwide and contains information on facility location, provider number, chain status, chain organization, business structure, and performance metrics. The intent of this data is to compare dialysis facilities through pre-set quality metrics determined by CMS. These metrics are subject to change and are updated annually. This data also allows for analysis on the state and makeup of the dialysis market as a whole, through examination of chain status, chain organization, and business structure. This research is comprehensive in its scope, as every Medicare-certified dialysis facility is included in the study population.

b) Data Collection

Based on the number and size of firms in the dialysis market, two groupings of firms were created in order to analyze how the prospective payment policy impacted different firm types. Determined by their size and for-profit status, the first grouping consists of the two largest for-profit dialysis providers: Davita Kidney Care and Fresenius Medical Care (Eliason et al., 2020; Hirth et al., 2013; Wilson, 2016). The second grouping consists of all other providers, referred to in this research as “small firms.” It is important to note that previous research examining the dialysis market has used these same groupings (Eliason et al., 2020; Hirth et al., 2013; Wilson, 2016). From this data, both provider number and chain organization were examined for each dialysis facility

over time. Utilizing the programming language R, a for loop was written to sort through each CMS dialysis facility compare annual file, aggregating the number of firms in each group defined above. A table of this information can be found in **Appendix A**.

c) Data Analysis

A comparative interrupted time series analysis (CITSA) was performed in the programming language STATA to examine the impact of the prospective payment policy on the dialysis industry makeup. Using group-specific linear time trends, the number of existing firms was tracked annually throughout the specified time period for the two separate groups: large chain dialysis firms and small firms. The CITSA was estimated to determine if the prospective payment policy had a significant impact on consolidation in the dialysis care market. The CITSA encompasses all Medicare-certified facilities that provided dialysis care in the United States, and thus includes the scope of the entire dialysis patient population in the country. The time runs from 2007 to 2020, and includes data that is collected annually. The pre-treatment period is defined as the years 2007-2010 while the post-treatment period is defined as the years 2011 and onward. The year 2011 was chosen as the intervention point because the prospective payment policy was implemented on January first of that year. The dependent variable in this research is defined as the number of firms in each grouping annually throughout the time period. Using the ITSA command in STATA, four lines of best fit were plotted to show trends for each grouping both during the pre-treatment and post-treatment period. The slopes of these lines show on-average trends in the number of open dialysis facilities from year to year, in both the pre-treatment and post-treatment period. Newey-West standard errors were used with a lag of four to adjust for serial correlation in the time series.

The CITSA is appropriate for the research for a few reasons. For one, there is a clear intervention implementation time, which lends itself well to a time series analysis. Secondly, a differences and differences (DID) methodology is not appropriate. In a DID approach, only one group is exposed to the treatment. However, this is not the case in the dialysis market as both groups are exposed to the PPS effects. Additionally, DID requires a parallel trends assumption in which the difference between the treatment and control group is constant over time in the absence of a treatment. This assumption is violated in the case of the dialysis industry, as the differences in the two groupings are changing in the pre-implementation period. The goal of a CITSA is to establish how a treatment affects each group in comparison to its baseline trend. The dialysis market is unique in the fact that two dominating firms have been growing in size prior to the prospective payment policy intervention period. The use of a CITSA will allow for the understanding as to whether or not the policy implementation exacerbated these trends significantly by examining the number of facilities in each grouping over time.

d) Model

To model the effects of the policy on large chain facilities vs. small firms, this research estimates:

$$Y_t = \beta_0 + \beta_1 trend_t + \beta_2 post_t + \beta_{3t} trend_t + \beta_4 treat + \beta_5 treat*trend_t + \beta_6 treat*post_t + \beta_7 treat*post_t*trend_t + t$$

In this model Y_t represents the number of Medicare-certified dialysis facilities in a given grouping at time t. The term *post* is a dummy variable to denote the time period

(pre-treatment or post-treatment) where post-treatment equals one. The term *treat* is a dummy variable to denote the grouping, where large chain equals one. The term *trend* represents time since the start of the study. β_1 represents the slope of the small firm grouping in the pre-treatment period. β_2 represents the change in level in the period immediately following intervention initiation in the small firm grouping. β_3 represents the difference between the pre-treatment and post-treatment slope of the small firm grouping. β_4 represents the difference in the level between large chain and small firm groupings prior to intervention. β_5 represents the difference in slope between small firms and large chain groupings in the pre-treatment period. β_6 represents the difference in the level between large chain and small firm groupings in the period immediately following intervention initiation. β_7 represents the difference in the slope between large chain and small firms during the post-treatment period compared with pre-treatment period.

The β_7 coefficient will allow this research to determine if there has been significant changes in market share as a result of the policy. This coefficient's statistical significance can help determine if the slopes of the two groupings are in fact diverging. If this coefficient is positive and significant, this research can provide evidence that there has been statistically significant consolidation in the dialysis market as a result of the prospective payment policy. The larger the coefficient of β_7, the more market share is being gained by the large chain grouping in the post-treatment period. This could be due to closures in small firms, or acquisitions by and new facility openings in the large chain grouping.

Results:

Before the policy intervention, large chain firms were growing by 206 facilities per year on average, represented by $\beta_1 + \beta_5$ ($p = 0.190$, $p < 0.001$) while small firms were shrinking by 13.5 facilities per year on average, represented by β_1 ($p = 0.190$). In the post-treatment period, large chain firms were growing by 295.86 facilities per year on average, represented by $[\beta_1 + \beta_5] + [\beta_3 + \beta_7]$ ($p = 0.190$, $p < 0.001$, $p = 0.008$, $p < 0.001$). The slope of small firms in the post-treatment period decreasing by 52.25 facilities per year on average, represented by $\beta_1 + \beta_3$ ($p = 0.190$, $p = 0.008$). The difference in changes from pre-treatment to post-treatment between the two groups is on average 131.62 facilities per year, represented by β_7 ($p < 0.001$). This difference is significant, and shows that the slopes of the two groups are diverging. This is evidence of significant consolidation in the dialysis market. Overall, large chain firms have increased their market share from 46.74 percentage points in 2007 to 72.09 percentage points in 2020. These results can also be found in **Table 1**.

Although trends in both groups were found before the policy implementation, the change in reimbursement structure did significantly exacerbate these trends, thus contributing to the increase in market share held by large chain dialysis firms. While it is not clear if the large chain grouping is acquiring increased market share through acquisitions, openings of new facilities, or closures of small firm facilities, it is clear that their market share is increasing significantly in the post-treatment period. Regardless of how large chain firms are gaining significant market share, the increased consolidation in the dialysis market shown by the time series can have unintended impacts on both patient care and prices. The graph for this time series can be found in **Appendix B**.

Table 1

Average change from baseline in the number of facilities per year post-PPS

	Coefficient	P value
β_1	-13.5	0.190
	(9.941)	
β_2	-40.85	0.262
	(35.39)	
β_3	-38.75	0.008*
	(13.05)	
β_4	-354	< 0.001**
	(19.44)	
β_5	216.5	< 0.001**
	(12.64)	
β_6	-45.02	0.581
	(12.64)	
β_7	131.62	< 0.001**
	(21.41)	

Newey-West 4 period standard errors in parentheses
= " * P < 0.01 ** P < 0.001 "

Discussion:

a) Capitation

It is important to understand the effects of capitation policies on healthcare markets for a number of reasons. These types of policies are increasing in popularity, and can likely affect the revenue of a given healthcare firm or facility (Conrad, 2015). While bundled payment policies are designed to increase payment efficiency and reduce healthcare expenditures, only a small amount of literature aims to explain their effects on firm viability and consolidation (Baicker & Levy, 2013). This research provides context to the effects of bundled payment policies on healthcare markets, specifically in the dialysis industry. The findings of this research provide evidence that there has been significant consolidation in the dialysis market following the implementation of the PPS. This shows an unintended consequence of shifting to reimburse dialysis through a bundled payment model.

Variations of capitated reimbursement models are being implemented in many aspects of healthcare in order to reduce unnecessary costs without compromising patient outcomes. For example, many bundled payment policies have been implemented in cardiovascular care in the recent past due to its high prevalence and costly nature (Shih, Chen, & Nallamothu, 2015). Additionally, in 2016 Medicare transitioned joint replacements to be reimbursed through a bundled payment method (Barnett et al., 2019). While bundled payment policies have potential to reduce unnecessary healthcare expenditures, the adverse effects must be examined as well. These types of policies shift financial risk from the payor to the provider, and have the potential to adversely affect firms who are not prepared financially. Firms may respond to capitation policies by

accounting for losses in revenue with increased use of services that are not covered by the bundled payment. In the case of dialysis, this could mean increasing the amount of labs patients receive for non dialysis care. This can be labs related to transplants, or labs for other conditions caused by ESRD (CMS, 2022).While most would agree that using policy to discourage behavior that utilizes wasteful practices is productive, if the financial consequences of these policies encourage consolidation in healthcare markets, those markets will eventually be powerful enough to negotiate higher prices in the long run.

b) Mergers and Acquisitions

In addition to capitation, M&A is another practice that is increasing in healthcare markets. The findings of this research provides evidence to support significant consolidation in the dialysis market. If the trends in the market continue in the years to come, the dialysis market will increasingly resemble a duopoly. The increased market control held by large chain firms will allow them to potentially negotiate for higher prices (Gaynor, 2018). Economic theory of perfect competition states that prices are lowest when many firms exist in the market with identical products, market share does not influence price, and individual firms do not have control over the competitive prices in the market (Mwachofi & Al-Assaf, 2011). As large for-profit firms continue to gain increased control over the dialysis market, the market moves further away from perfectly competitive principles and towards monopolistic principles where dominating firms act as price makers (Mwachofi & Al-Assaf, 2011).

Outside of the dialysis industry, other healthcare markets have been experiencing similar consolidation practices. In attempts to not raise antitrust concerns, many physician practices grow their firms through multiple small acquisitions rather than large

ones (Capps, Dranove & Ody, 2017). While over time dominating firms with large shares of market control emerge in many cases, there is no prior evidence that these firms have been anticompetitive in the eyes of federal law. This "whale eats krill" strategy occurs in many healthcare markets, and its effects are troublesome for both antitrust agencies and policy makers (Capps, Dranove & Ody, 2017). One study found that in 2013, 22 percent of physician markets were highly concentrated, defined as having an HHI above 2,500 (Capps, Dranove & Ody, 2017). HHI, or the Herfindahl-Hirschman Index, is the sum of squared market shares and remains smaller when markets consist of numerous small firms of equal size. As the market is taken over by one or more dominating firms, the HHI rises, and the market is said to be more "concentrated". It is reported that two thirds of specialty physician markets were highly concentrated in 2018 (Gaynor, 2018). Additionally, physician acquisitions by hospitals are also becoming increasingly common, with 33 percent of all physicians employed by hospitals in 2018 (Gaynor, 2018).

Evidence supports economic theory in suggesting that highly concentrated markets experience higher prices compared to that of more competitive markets (Gaynor, 2018). In addition, some evidence suggests that hospitals with limited competitors are able to negotiate more favorable forms of payments, such as FFS (Gaynor, 2018). This poses a problem for policy makers who believe that movement away from FFS towards a capitated model is more favorable. While capitated policies may help reduce costs in the short term, they will not be effective if they inadvertently discourage competition that may have stimulated lower prices and valuable innovation (Gaynor, 2018).

It has been established that M&A in healthcare markets is increasing and driving up prices without necessarily increasing quality of care, as shown by evidence in the dialysis market. Due to the "whale eats krill" strategy, the federal government may not be effective at protecting healthcare markets again antitrust activities. If consolidation cannot necessarily be stopped, other policy interventions may be necessary to keep prices low and ensure quality of care. One main policy intervention that may help is increasing transparency in pricing, costs, and outcomes so that more research can be done to examine what best practices are (Baicker & Levy, 2013; Gaynor, 2018). A national, publicly available database with data on costs, prices, and utilization could be helpful for future analysis and insights, as it is speculated that firms with increased market share may be able to reduce their costs by negotiate for lower prices with suppliers (Baicker & Levy, 2013; Gaynor, 2018). Another policy that can help protect healthcare markets could involve federal and state agencies changing their guidelines so that firms must report smaller acquisitions as well as big ones. This could help to combat the "whale eats krill" strategy utilized in the dialysis industry as well as other healthcare markets. Any policy that effectively reduces unnecessary costs without compromising on patient care will help improve the United States healthcare system.

c) Limitations

This research faced several limitations in its scope and implementation. One main limitation is this research's inability to control for how the QIP may have affected consolidation in the dialysis market. Because the QIP is directly linked to reimbursements for dialysis centers, it is possible that reductions in firm revenues could have affected closures and acquisitions in the dialysis market. The metrics for the QIP are

updated annually, making it difficult to control for any changes that may have occurred from year to year. Although Sloan et al., predicts that the QIP would have only had modest effects on acquisitions and closures in the dialysis market, the actual effect has not been supported with sufficient evidence (2021).

While this research utilized the policy implementation year (2011) as the beginning of the treatment period, it is important to note that note that this policy was announced in 2007, giving dialysis firms multiple years to adjust their practices in preparation. This could explain some of the pre-treatment trends. However, the policy did not start affecting reimbursements until 2011.

This research was also restricted to public databases, which narrowed the scope of this project. Because of this, the project is limited in its ability to conclude any seminal findings. This research is only able to support existing conclusions in other research, finding similar results utilizing a new methods approach.

Lastly, counts of firms in each groupings were generated using CMS dialysis facility compare data, which may have had variations and errors in its database. While ample effort was taken to accommodate for variations in the data files, it is possible that some errors exist in the count of firms.

Conclusion:

Changing the reimbursement structure for dialysis care intended to discourage unnecessary PID practices and reduce healthcare expenditures. However, reimbursements are closely tied to revenues, causing this policy to affect the dialysis market in unintended ways. The evidence of consolidation in the dialysis market found in this research and

others is troublesome for future policy. Additional research is needed in order to contextualize the relationship between bundled payment policies and M&A in healthcare markets. Additionally, research that could help quantify how for-profit status of a given firms is likely to affect consolidation in healthcare markets could provide crucial evidence for future policy.

The design of the United States healthcare system permits healthcare services to be provided more or less like any other market (Gaynor, 2018). In order for the current system to uphold, these markets must be preserved so that they can function properly. Currently, prices are high and increasing compared to that of other countries, at least in part due to consolidation in healthcare markets. While competition helps to keep prices low, consolidation in healthcare markets is inhibiting best practices, and should be combatted by future policy. It is crucial for both the intended and unintended consequences of health policy to be understood in order to preserve competitive markets, reduce unnecessary costs, and improve quality of care.

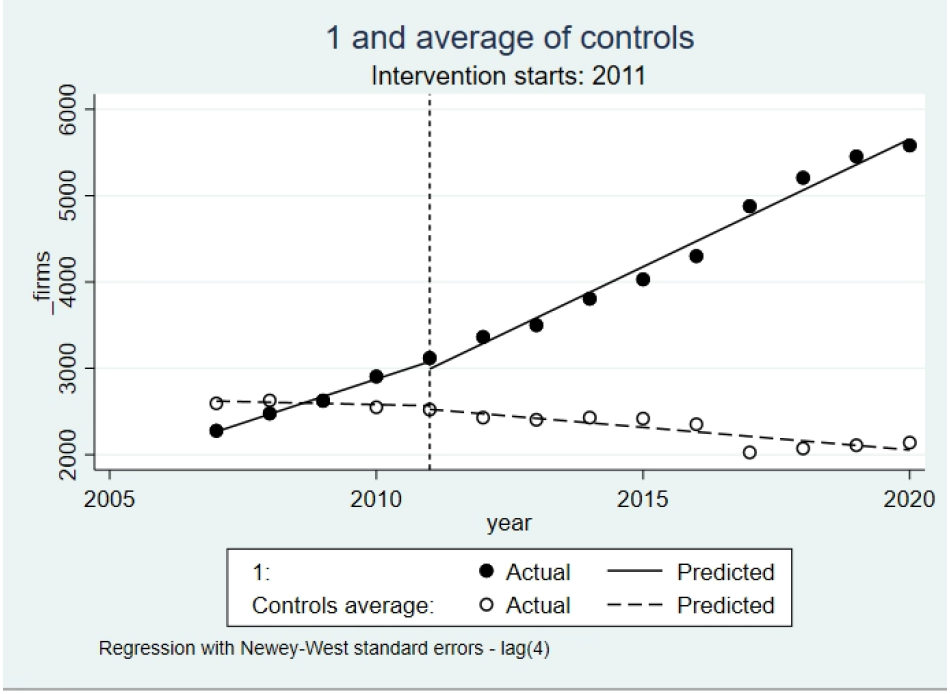
Appendix A: Data

Table 2: Number of Medicare-certified Dialysis facilities in Each Grouping by Year

Year	**For-Profit Large Chain**	**Small Firm**
2007	2278	2595
2008	2478	2629
2009	2624	2629
2010	2906	2550
2011	3120	2523
2012	3364	2430
2013	3500	2405
2014	3807	2430
2015	4031	2419
2016	4300	2353
2017	4978	2027
2018	5208	2073
2019	5455	2110
2020	5528	2140

Appendix B: CITSA Graph

Figure 1: Dialysis Industry Over Time



References

Areeda, P., & Hovenkamp, H. (2011). *Fundamentals of antitrust law* (Vol. 10). Wolters Kluwer.

Baicker, K., & Levy, H. (2013). Coordination versus competition in health care reform. *The New England journal of medicine*, *369*(9), 789.

Barnett, M. L., Wilcock, A., McWilliams, J. M., Epstein, A. M., Joynt Maddox, K. E., Orav, E. J., ... & Mehrotra, A. (2019). Two-year evaluation of mandatory bundled payments for joint replacement. New England Journal of Medicine, 380(3), 252-262.

Berenson, R. A., & Rich, E. C. (2010). US approaches to physician payment: the deconstruction of primary care. *Journal of general internal medicine*, *25*(6), 613-618.

Besarab A, Bolton WK, Browne JK, Egrie JC, Nissenson AR, Okamoto DM, Schwab SJ, Goodkin DA. The effects of normal as compared with low hematocrit values in patients with cardiac disease who are receiving hemodialysis and epoetin. N Engl J Med. 1998 Aug 27;339(9):584-90. doi: 10.1056/NEJM199808273390903. PMID: 9718377.

Bhat, P., Sokolowski, W., & Bhat, J. G. (2009). Projected impact of the proposed" bundled" ESRD payment system on a small dialysis organization. *Nephrology news & issues*, *23*(7), 46-48.

Brookhart, M. A., Schneeweiss, S., Avorn, J., Bradbury, B. D., Liu, J., & Winkelmayer, W. C. (2010). Comparative mortality risk of anemia management practices in incident hemodialysis patients. *Jama*, *303*(9), 857-864.

Burns, L. R., & Pauly, M. V. (2018). Transformation of the health care industry: curb your enthusiasm?. The Milbank Quarterly, 96(1), 57-109.

Capps, C., Dranove, D., & Ody, C. (2017). Physician practice consolidation driven by small acquisitions, so antitrust agencies have few tools to intervene. *Health Affairs*, *36*(9), 1556-1563.

Centers for Medicare & Medicaid Services. (2017). CMS Office of the Actuary releases 2017 national health expenditures.

Conrad, D. A. (2015). The theory of value‐based payment incentives and their application to health care. *Health Services Research*, *50*, 2057-2089.

DaVita, (2005). "2004 10-K form," Retrieved April 15, 2022 from http://investors.davita.com/financial-information/financial-reports

Davita, (2022). *Understanding your lab work*. DaVita. Retrieved May 2, 2022, from https://www.davita.com/education/kidney-disease/symptoms/understanding-your-lab-work

Eliason, P. J., Heebsh, B., McDevitt, R. C., & Roberts, J. W. (2020). How acquisitions affect firm behavior and performance: Evidence from the dialysis industry. The Quarterly Journal of Economics, 135(1), 221-267.

End stage renal disease (ESRD) prospective payment system (PPS). CMS. (n.d.). Retrieved April 28, 2022, from https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/ESRDpayment

ESRD Quality Incentive Program. CMS. (2022). Retrieved April 14, 2022, from https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/ESRDQIP

Gaynor, M. (2018). Examining the impact of health care consolidation. *Statement before the Committee on Energy and Commerce Oversight and Investigations Subcommittee, US House of Representatives*.

Hirth, R. A., Turenne, M. N., Wheeler, J. R., Nahra, T. A., Sleeman, K. K., Zhang, W., & Messana, J. A. (2013). The initial impact of Medicare's new prospective payment system for kidney dialysis. *American journal of kidney diseases*, *62*(4), 662-669.

Iglehart, J. K. (2011). Bundled payment for ESRD—including ESAs in Medicare's dialysis package. *Minnesota medicine*, *94*(5), 36.

Kaplan, R., & Haas, D. (2014). *How Not to Cut Health Care Cost*. Harvard Business Review.

Lineen, J. (2014). Hospital consolidation:“safety in numbers” strategy prevails in preparation for a value-based marketplace. *Journal of Healthcare Management*, *59*(5), 315-317.

Neuman, P., Cubanski, J., & Damico, A. (2015). Medicare per capita spending by age and service: new data highlights oldest beneficiaries. *Health Affairs*, *34*(2), 335-339.

Mechanic, R. E., & Altman, S. H. (2009). Payment Reform Options: Episode Payment Is A Good Place To Start: Before provider payments are reduced, our payment system must be reformed to encourage the more efficient delivery of care. *Health Affairs*, *28*(Suppl2), w262-w271.

Medicare beneficiaries as a percent of total population. KFF. (2019). Retrieved November 20, 2021, from https://www.kff.org/medicare/state-indicator/medicare-beneficiaries-as-of-total-pop/?curr

entTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D

Mwachofi, A., & Al-Assaf, A. F. (2011). Health care market deviations from the ideal market. *Sultan Qaboos University Medical Journal*, *11*(3), 328.

Peter G. Peterson Foundation. (2021, September 2). *Budget basics: Medicare*. Peter G. Peterson Foundation. Retrieved November 20, 2021, from https://www.pgpf.org/budget-basics/medicare.

Pollack, A. (2007, September 16). *The Dialysis Business: Fair Treatment?* The New York Times. Retrieved April 15, 2022, from https://www.nytimes.com/2007/09/16/business/16dial.html

Raghupathi, W., & Raghupathi, V. (2018). An empirical study of chronic diseases in the United States: a visual analytics approach to public health. *International journal of environmental research and public health*, *15*(3), 431.

Saeed, M. K., Ho, V., & Erickson, K. F. (2020, January). Consolidation in dialysis Markets—Causes, consequences, and the role of policy. In *Seminars in Dialysis* (Vol. 33, No. 1, pp. 90-99).

Saran R, Robinson B, Abbott KC, et al. US Renal Data System 2019 Annual Data Report: epidemiology of kidney disease in the United States. Am J Kidney Dis. 2020;75(1)(suppl 1):Svii-Sviii, S1-S64.

Seyedin, H., Afshari, M., Isfahani, P., Hasanzadeh, E., Radinmanesh, M., & Bahador, R. C. (2021). The main factors of supplier-induced demand in health care: A qualitative study. *Journal of Education and Health Promotion*, *10*.

Shih, T., Chen, L. M., & Nallamothu, B. K. (2015). Will bundled payments change health care? Examining the evidence thus far in cardiovascular care. Circulation, 131(24), 2151-2158.

Singh, A. K., Szczech, L., Tang, K. L., Barnhart, H., Sapp, S., Wolfson, M., & Reddan, D. (2006). Correction of anemia with epoetin alfa in chronic kidney disease. *New England Journal of Medicine*, *355*(20), 2085-2098.

Sloan, C. E., Hoffman, A., Maciejewski, M. L., Coffman, C. J., Trogdon, J. G., & Wang, V. (2021, November). Trends in Dialysis Industry Consolidation After Medicare Payment Reform, 2006-2016. In *JAMA Health Forum* (Vol. 2, No. 11, pp. e213626-e213626). American Medical Association.

Swaminathan, S., Mor, V., Mehrotra, R., & Trivedi, A. N. (2014). Effect of Medicare Dialysis Payment Reform on Use of Erythropoiesis Stimulating Agents. *Health Services Research, 50*(3), 790-808. doi:10.1111/1475-6773.12252

Thamer, M., Zhang, Y., Kaufman, J., Cotter, D., Dong, F., & Hernan, M. A. (2007). Dialysis facility ownership and epoetin dosing in patients receiving hemodialysis. *Jama*, *297*(15), 1667-1674.

U.S. Department of Health and Human Services. (2021). *Kidney Disease Statistics for the United States*. National Institute of Diabetes and Digestive and Kidney Diseases. Retrieved May 2, 2022, from https://www.niddk.nih.gov/health-information/health-statistics/kidney-disease

U.S. Government Accountability Office (2012, October). Medicare Part B Drug Spending. Publication No. GAO-13-46R, Retrieved from https://www.gao.gov/assets/650/649459.pdf

United States Renal Data System. (2017) Healthcare Expenditures for Persons with ESRD. Retrieved November 30, 2021, from https://adr.usrds.org/2020/end-stage-renal-disease/9-healthcare-expenditures-for-persons-with-esrd

Weiner, D., & Watnick, S. (2017). The ESRD quality incentive program—can we bridge the chasm?. *Journal of the American Society of Nephrology*, *28*(6), 1697-1706.

Wetmore, J. B., Tzivelekis, S., Collins, A. J., & Solid, C. A. (2016). Effects of the prospective payment system on anemia management in maintenance dialysis patients: implications for cost and site of care. *BMC nephrology*, *17*(1), 1-9.

Wilson, N. E. (2016). For-profit status and industry evolution in health care markets: evidence from the dialysis industry. *International journal of health economics and management*, *16*(4), 297-319.

Zhang, Y., Thamer, M., Kshirsagar, O., Cotter, D. J., & Schlesinger, M. J. (2014). Dialysis chains and placement on the waiting list for a cadaveric kidney transplant. *Transplantation*, *98*(5), 543-551.