DOES REDUCING HOSPITAL READMISSION RATE DECREASE THE INPATIENT HEALTH EXPENDITURE IN MEDICARE ACCOUNTABLE CARE ORGANIZATIONS?

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ABSTRACT

The Accountable Care Organizations (ACOs) is a new delivery model initiated by the Affordable Care Act to reform the current fee-for-service payment structure, control the skyrocketing healthcare costs in recent years, and improve providers' performance. This study utilizes the public-use data from the Center for Medicare and Medicaid Services (CMS) and performs a multivariate regression analysis of per capita health expenditure on a variety of variables include readmission rate per 1,000, size, demography and several performance metrics. The result shows strong statistical significance between per capita health expenditure and hospital readmission rates, which strengthens the study's hypothetical model and underlying assumptions. This study is the first attempt to evaluate an innovative delivery model of ACA using quantitative tools, and provides interesting insights into the country's healthcare reform discussion.

Thanks to my family, teachers, friends and colleagues
for all their support during my graduate school years

“FORTUNA ADVERSA VIRUM MAGNAE SAPIENTIAE NON TERRET.”

Jingyuan Qian

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INTRODUCTION

Healthcare cost in the United States has been rapidly increasing since the early 21st century. In order to reduce the waste of resources and improve the overall efficiency of healthcare utilization, the Centers for Medicare and Medicaid Services (CMS) has made various efforts to transform the current payment model of healthcare services. Starting in 2012, CMS has initiated the formation of Medicare Accountable Care Organizations (Medicare ACOs), where health providers in the ACOs are reimbursed based largely on the quality of their services and their performance to save unnecessary costs, instead of the volume of services they offered to patients.

After three years since the implementation of the Medicare ACO program, healthcare practitioners began to question whether improving healthcare quality and efficiency can truly reduce unnecessary health costs. With the two years of public use data on 333 Medicare ACOs reported by CMS, this question can be assessed using quantitative methods. This paper uses inpatient readmission rate as the main indicator of an ACO's performance and discusses its relationship with the ACO's per capita inpatient health expenditure. This research will contribute to current policy debates on whether Medicare ACOs and its performance improvement measure can effectively contain the skyrocketing healthcare cost.

This structure of this paper is divided into several chapters. The paper begins with a brief review of previous studies which discuss the relationship between readmission rates and medical expenditure, and how the formation of Medicare ACOs influenced the cost-saving performance of physicians and hospitals. Then, the paper develops an econometric model that attempts to explain the causal effect of reducing readmission rate on containing excessive medical expenditure, and conceptualize the model in the pure mathematical form. Third, the paper will

discuss the source and methodology of data used in this study, and perform an exploratory analysis on the raw data. Fourth, the study will perform several regression analysis that contains different subsets of data using various methods, and explain the analytical results from a critical perspective. The study will end with a policy discussion chapter that explores how the findings in this study would shed light on the ongoing discussion of ACOs in healthcare industry.

MOTIVATION

The Medicare program, a government-run healthcare plan for senior citizens, has been consistently criticized for its inefficiency and waste of healthcare resources. Before the implementation of the Affordable Care Act in 2010, CMS applied a Fee-For-Service (FFS) payment model in the reimbursement of medical providers. Healthcare providers were paid for by CMS according to the total volume of services they provided to Medicare beneficiaries. Since the payment to health providers was unrelated with the quality and outcome of care, this payment model encouraged physicians to give more treatments to Medicare beneficiaries, regardless of whether these treatments would improve the quality of care. This payment model also encouraged patients to request more medical services during their treatment, no matter whether these services are necessary.

The "Fee-For-Services" payment model caused many problems in Medicare operation. Since the payment to providers was solely based on the volume of care, physicians tended to provide more services to Medicare beneficiaries and caused the healthcare cost to rise tremendously. The Journal of American Medical Association (JAMA) estimated that health expenditure rose by 91%

in 2012 from 2000.[1] The skyrocketing health cost imposed heavy financial burden on the Medicare program and challenged the Federal Government's capacity to finance Medicare in a sustainable way. In 2011, Medicare spending accounted for about 15% of the Federal budget, and the share is projected to rise to 17% by 2020.[2] As more baby-boomers reached their retirement age, the population eligible for Medicare benefits would increase rapidly in the next ten years. A report released by the Trustees of the Medicare Program estimated that Medicare fund would become insolvent in 2024 as a result of rising healthcare costs and expanding population of beneficiaries.[3] Thus, how to control the growth of health expenditure has become a priority for health policymakers.

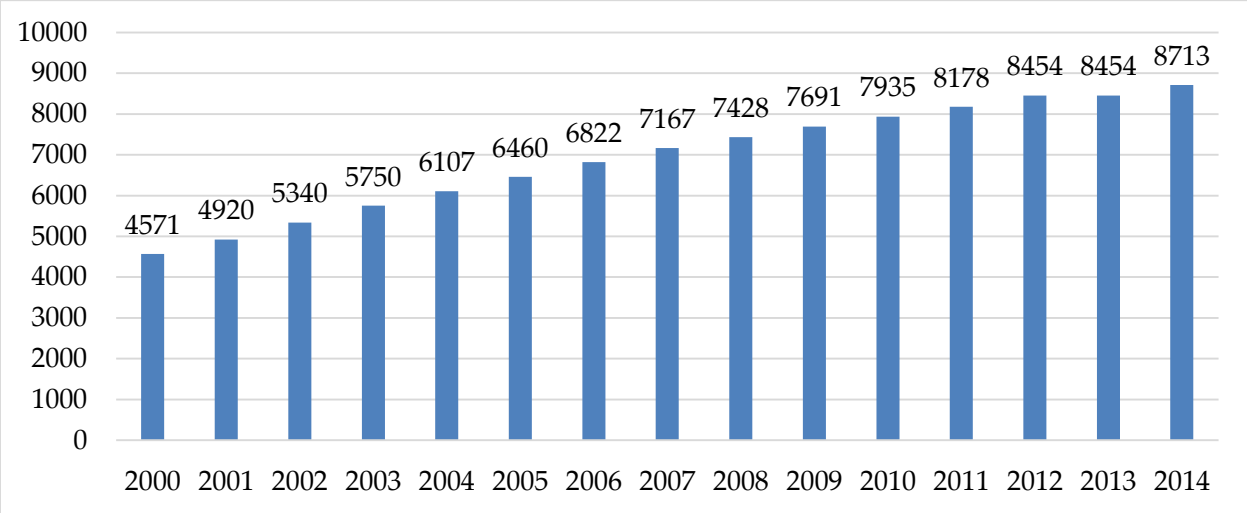

Figure 1. Per Capita Expenditure on Healthcare, 2000 – 2014

[1] Forbes. "US Health Care Cost Rise Faster than Inflation." Retrieved online on September 27, 2015. http://www.forbes.com/sites/mikepatton/2015/06/29/u-s-health-care-costs-rise-faster-than-inflation/
[2] Kaiser Family Foundation. Issue Brief: A primer on Medicare Financing. Retrieved online on September 27, 2015. http://kff.org/health-reform/issue-brief/a-primer-on-medicare-financing/.
[3] Avik Roy (2012). Trustees: Medicare Will Go Broke in 2016, If You Exclude Obamacare's Double-Counting. Retrieved online on 12/5/2015 at http://www.forbes.com/sites/aroy/2012/04/23/trustees-medicare-will-go-broke-in-2016-if-you-exclude-obamacares-double-counting/

Containing the rapid growth of U.S. health expenditure has been a major concern in the Obama Administration's healthcare reform. The Patient Protection and Affordable Care Act (PPACA) adopted an important payment model to contain healthcare cost growth, known as Medicare Shared Savings Program Accountable Care Organizations (MSSP ACOs).[4] The MSSP ACOs are organizations voluntarily consisted of physicians, hospitals and other providers collectively accountable for quality and total costs across the full continuum of care for Medicare patients.[5] Under the new payment model, CMS's reimbursement to ACOs are tied to their quality outcomes and cost reduction performance, rather than the amount of care they provide to Medicare beneficiaries. The ACOs showing successful reduction of health expenditures and improvement of healthcare quality will receive a portion of their shared savings from CMS as a financial incentive, while the ACOs that perform poorly on healthcare quality and cost reduction will face penalties in Medicare reimbursement. The MSSP ACO program started in September 2012; by October 2015, a total number of 335 ACOs have been enrolled in this program, which were accountable for 622,265 Medicare beneficiaries in all 50 U.S. states and Puerto Rico.[6]

The CMS conducts an annual evaluation of quality and financial performance on all participating ACOs to examine whether they have successfully met their quality and cost-saving targets. CMS has established a standardized procedure for the performance assessment of Medicare ACOs. At the beginning of the program year, CMS will establish a benchmark for each ACO using the most recent available 3 years of per-beneficiary expenditures for Medicare Fee-

[4] Centers for Medicare and Medicaid Services. Affordable Care Act. Retrieved online on Dec. 08, 2015. http://www.medicaid.gov/affordablecareact/affordable-care-act.html
[5] American Association of Clinical Endocrinologists. Medicare "Accountable Care Organizations": Shared Savings Program – New Section 1899 of Title XVIII. Retrieved online at: https://www.aace.com/files/cmspremlimqa.pdf.
[6] CMS News Release: *Medicare ACOs Provide Improved Care While Slowing Cost Growth in 2014*. https://www.cms.gov/Newsroom/MediaReleaseDatabase/Fact-sheets/2015-Fact-sheets-items/2015-08-25.html

For-Service beneficiaries assigned to the ACO. At the end of each program year, CMS will compare the ACO's actual expenditure against the benchmark to determine whether the ACO has achieved its shared saving goals and determine its eligibility for the bonus.[7] The quality performance of ACOs, on the other hand, is calculated using a more complicated matrix. The CMS listed 33 quality measures to determine an ACO's health service quality, including both quantitative and qualitative measures on health service utilization, physician quality, and patient satisfaction with the service they receive. In the annual performance assessment, both cost reduction and quality improvement measures are taken into account to determine an ACO's eligibility for financial incentives.[8]

LITERATURE REVIEW

With the implementation of the Medicare Shared-Savings Program, many scholars have evaluated the Medicare ACO's potential effects to current Medicare system. Several studies have assessed the demographic and regional variations in the provider participation of MSSP ACO program. Baloh at al. (2015) finds that health providers in rural areas are less likely to form ACOs and enroll in the program than urban providers.[9] The authors explain that rural healthcare providers may not expect a short-term financial return by participating in the shared-savings program, and CMS fails to raise the health provider's awareness of the program in many rural areas. MacKinney (2013) samples over 100 ACOs in the nation and notices the strong urban-

[7] Centers for Medicare and Medicaid Services. *Summary of Final Rules Provisions for Accountable Care Organizations under the Medicare Shared Savings Program.* Retrieved December 8, 2015. https://www.cms.gov/medicare/medicare-fee-for-service-payment/sharedsavingsprogram/downloads/aco_summary_factsheet_icn907404.pdf

[8] Kaiser Family Foundation. *Issue Brief: A primer on Medicare Financing.* Retrieved online on September 27, 2015. http://kff.org/health-reform/issue-brief/a-primer-on-medicare-financing/.

[9] J. Baloh, A.C. MacKinney, K.J. Mueller, T. Vaughn, X. Zhu, and F. Ullrich. 2015. *Developmental Strategies and Challenges of Rural Accountable Care Organizations".* Rural Policy Brief. 2015 (2015): 1-4. Retrieved online at: http://www.ncbi.nlm.nih.gov/pubmed/26364326

rural disparity in provider enrollment of the program. The study finds that Medicare ACOs only operate in only 16.7% of non-metropolitan counties, and only 9 ACOs operate exclusively in non-metropolitan counties. The authors argue that the main reason for non-urban providers' underrepresentation in the program is the lack of access to information and federal resources. In order to reduce the urban-rural disparity in program enrollment, Baloh et al. (2014) propose several strategies to facilitate the ACO formation in rural areas, including 1) expanding the use of electronic patient records, 2) strengthening CMS outreach to local healthcare providers, and 3) promoting previous risk-sharing experience to rural areas.[10]

Another question previous literatures frequently ask is Medicare ACO's efficacy in reducing healthcare costs and improving performance. Yeung et al (2014), from a qualitative perspective, summarize the possible changes that MSSP may bring to current healthcare delivery model. The authors admit that, although it remained clear whether ACO would lead to higher-quality healthcare at lower costs in the long run, existing data showed that the ACO model would bring a systematic change in the efforts to improve patient care and contain healthcare costs. The authors also suggest that, in order to achieve the cost-saving goals of Medicare ACOs, each stakeholder group (providers, payers, patients, and manufacturers) must monitor the reactions and relationships between all players in the care delivery process.[11] Schwartz et al (2015) use Medicare ACOs' financial and quality performance data in 2012 to examine whether the formation of Medicare ACOs was associated with a reduction in the use of low-value services.

[10] J. Baloh, X. Zhu, T. Vaughn, A.C. MacKinney, K.J. Mueller, F. Ullrich, and M. Nattinger. 2014. *Facilitating the formation of accountable care organizations in rural areas*. Rural Policy Brief. 2014 (2014): 1-4. Retrieved online at: http://www.ncbi.nlm.nih.gov/pubmed/25399474.

[11] W. Yeung, H. Burns 3rd, and D. Loiacono. 2011. "Are ACOs the Answer to High-Value Healthcare?" American Health & Drug Benefits. 4 (7): 441-50. Retrieved online at: http://www.ncbi.nlm.nih.gov/pubmed/25126368

The authors compare the use of low-value services between Medicare beneficiaries attributed to health care provider groups that enrolled in Medicare ACOs and those beneficiaries attributed to non-ACO health providers in 2012-13. The authors' results show that the ACO enrollment was associated with modest reductions in low-value healthcare services. Nyweide (2015) examines the Medicare ACO performance data in the first two years (2012 and 2013) and finds that beneficiaries aligned with ACOs, as compared with general Medicare beneficiaries, show smaller increases in total Medicare expenditures in utilization of different health services. All these studies show that Medicare ACOs are effective in reducing health costs and improving provider efficiency.

However, some other studies show that providers who enrolled in Medicare ACOs do not perform better in cost reduction and quality improvement. Singh et al. (2015) analyze the quality performance data for Medicare ACOs and non-ACO physician groups for the single coronary artery disease measure and four diabetes mellitus measures in 2012. The authors found no statistically significant difference in reported quality measures between ACOs and non-ACO physician groups.[12] Behm (2014) argues that although some Medicare ACOs show significant results in cost reduction and quality improvement, the quality and financial performance results for 336 ACOs are mixed and show both positive and negative outcomes.[13] The author further argues a methodological problem in the evaluation of Medicare ACOs' effectiveness – the performance result of an ACO as a group did not represent the performance of individual

[12] S. Singh, S. Khosla, and A. Sethi. 2015. *Comparison of Healthcare Quality Outcomes Between Accountable Care Organizations and Physician Group Practices*. The Journal of Medical Practice Management : MPM. 30 (4). Retrieved online at: http://www.ncbi.nlm.nih.gov/pubmed/26223106

[13] C.R. Behm. 2015. *ACOs in real life: a reflection on the Medicare Shared Savings Program*. The Journal of Medical Practice Management : MPM. 30 (5). Retrieved online at: http://www.ncbi.nlm.nih.gov/pubmed/26062323

providers enrolled in each ACOs. Whether each participant in ACO showed significant improvement in service quality and cost efficiency than before remains unclear.

Many scholars also attempt to explain what factors lead to an ACO's success in meeting its quality and cost-reduction goals. Schulz et al. (2015) focus on whether an ACO's performance is correlated to how the shared savings is distributed among its participants.[14] The authors studied whether different shared savings distribution plans may affect the success of Medicare ACOs to achieve its proposed cost-saving goals. This study conducts a cross-sectional study to analyze the Year-1 data of Medicare Shared Savings Program and identified each ACO's shared savings distribution plan based on the ACO's public reporting file. The study did not find statistically significant correlation between the ACO's shared saving distribution pattern and its cost-saving outcomes. Anderson et al. (2014) hypothesized that an ACO's likelihood to achieve quality standards is influenced by its group size due to "scale economy". The authors analyze the Year 1 data of Medicare ACOs but find that larger group size did not consistently lead to better performance in cost reduction and quality improvements.[15]

Another main focus addressed by previous literature is to examine whether the two goals of Medicare ACOs – reducing unnecessary costs and improving the quality of care – are interrelated. In other words, does reducing medical costs automatically lead to an improvement in quality of healthcare? Evans (2014) analyzes the quality performance data of 135 Medicare ACOs in 2012 and argues that a moderate correlation exists between better financial

[14] J. Schulz, M. DeCamp, and S.A. Berkowitz. 2015. "Medicare Shared Savings Program: public reporting and shared savings distributions". The American Journal of Managed Care. 21 (8): 546-53.
[15] Anderson RE, JZ Ayanian, AM Zaslavsky, and JM McWilliams. 2014. "Quality of care and racial disparities in medicare among potential ACOs". Journal of General Internal Medicine. 29 (9): 1296-304. Retrieved online at: http://www.ncbi.nlm.nih.gov/pubmed/24879050

performance and higher service quality.[16] This study selects 5 quality performance measures and finds that Medicare ACOs that earned bonuses for shared savings also performed significantly better in these 5 performance categories. The author then argues that cost efficiency and quality improvement are not two mutually independent goals, but show a certain level of co-dependency on each other.

Although the Medicare Shared-Savings ACOs is an emerging payment model in its experimental phase, advocates for this model have also attempted to construct a theoretical framework on whether lower readmission rate will lead to lower per capita inpatient expenditure in an ACO. Studies on the hospital level have shown that readmission rate is a strong indicator of healthcare quality and operational efficiency.[17] Below provides a simplified explanatory framework on the causal relationship between readmissions and inpatient expenditure.

Multiple factors can cause a patient's readmission to a hospital. Many previous studies stress a difference between unavoidable and avoidable readmissions. Unavoidable readmission occurs when a patient is hospitalized for a new condition which is totally unrelated with the initial admission. For example, someone may be readmitted for fracturing his leg after he was hospitalized for pneumonia a month ago. In other cases, readmissions are deliberately planned by healthcare providers for treatment purposes. Cancer patients are often required to return to hospitals after chemotherapy for monitoring purposes. Unavoidable readmissions are appropriate and even necessary in some circumstances.

[16] Modern Healthcare. Limited Medicare ACO quality data show sharp variations in performance. http://www.modernhealthcare.com/article/20140503/MAGAZINE/305039990

[17] Bobbi Brown (2015). Hospital Readmissions Reduction Program: Keys to Success. Health Catalyst. Retrieved online at: https://www.healthcatalyst.com/healthcare-data-warehouse-hospital-readmissions-reduction

Another type of readmissions is avoidable and often viewed as inefficient. These readmissions are caused by the ineffective care during the initial hospitalization and could be prevented by improving quality of care. Specific reasons for a patient being readmitted for the same reason include ineffective discharge planning, failure to reconcile medications, insufficient transfer of information at discharge, and failures in coordination of care and post-discharge monitoring of patients.[18] For instance, older patients may have difficulty following the confusing post-discharge instructions by physicians, which caused their conditions to worsen and require readmission to the hospital.

Previous studies demonstrate that a correlation exists between avoidable readmissions and per capita expenditure on the hospital level. One often-cited theory, proposed by Allen Dobson et al (2012), argues that higher readmission rate lead to higher per capita healthcare cost because patients readmitted to hospitals have more severe conditions than those hospitalized for the first time.[19] Since avoidable readmissions are frequently resulted from insufficient quality of care during the initial hospitalization, readmitted patients often experience more complicated conditions and require more expensive treatment regimen and medications. Therefore, reducing unplanned readmissions will decrease the costs related to the treatment of more complicated conditions.

Previous studies also present empirical evidence that shows a positive relationship between readmission rate and Medicare health expenditure. A research conducted by Advisory Board

[18] NCQA (2013). Reducing readmissions: measuring health plan performance. 2012 Insights for Improvement. National Center for Quality Assurance. Retrieved online at: http://www.ncqa.org/portals/0/Publications/2012%20BI_NCQA%20ReAdMi%20_Pub.pdf

[19] Allen Dobson et al. *Use of Home Health Care and Other Care Services among Medicare Beneficiaries: Baseline Statistics of Acute Care: Hospital Readmissions by Episode Type for Select MSDRGs and Chronic Conditions.* Alliance for Home Health Quality and Innovation Working Paper Series. July 18, 2012. Retrieved online at http://www.ahhqi.org/images/pdf/cacep-wp4-baselines.pdf

Company reviewed all Medicare Part A and Part B claims for 5% of beneficiaries between 2007 and 2009. They assessed all episodes of care across various care settings, including hospitals and home health care providers. The research found that the average healthcare expenditure was $33,000 for Medicare patients who were readmitted one time, compared to $15,000 for Medicare patients who were not readmitted.[20] Empirical evidence have shown that readmission is a significant factor that caused the healthcare cost to rise.

Although many previous studies affirm the relationship between readmission rate and healthcare expenditure, several scholars note that the effect of readmission rate on cost can vary significantly by regional, demographical and socioeconomic factors. Boccuti (2015) shows evidence that readmission of older patients will induce more cost to hospitals than younger patients. Fischer (2014) shows that holding other factors equal, the risk of readmission varies among different demographic groups. These studies indicates that some risk-adjustment measures are necessary when analyzing readmission rate's impact on cost.

CONCEPTUAL MODEL

The main assumption of this study is that lowering readmission rate can reduce the total per capita health expenditure through reducing the administrative costs generated in serving readmitted patients. A health organization's expenditure is composed of two parts: medical costs and administrative costs. The medical costs are determined mainly by "volume" – namely, the total amount of services provided and the total amount of patients served. This portion of costs cannot be reduced by reforming a health system's delivery model. Another portion of cost is

[20] Advisory Board Company. *Readmissions more than double the cost of care.* Advisory Board Daily Briefing. July 25, 2012. Retrieved online at: https://www.advisory.com/Daily-Briefing/2012/07/25/Readmissions-more-than-double-the-cost-of-care

administrative costs – cost generated by the administrative processing during the admissions process of each patient. The two categories of costs can be represented as follows:

$$E = U(n, u) + A(r)$$

In this formula, the readmission rate *r* impacts expenditure E through changing the administrative portion (A) of costs. Because serving a readmitted patient requires more administrative costs by examining past medical history, retrieving the patient's health records, and determining whether the patient's symptom is linked with his/her first admission, the increasing administrative costs resulted from readmissions will consequently lead to an larger health expenditure E.

This study aims to test whether lower readmission rate is associated with lower per capita inpatient expenditure in Medicare ACOs. In this model, readmission rate is measured as the total number of short-term acute care readmissions per 1,000 Medicare discharges, and the per capita inpatient expenditure is measured as per capita expenditures on inpatient services for assigned Medicare beneficiaries.

The two variables have strong internal validity and can properly represent the objects measured in this study. As the previous section mentioned, readmission rate can serve as a good indicator of healthcare quality. High readmission rates represent failures in discharge planning and follow-up care, and missed opportunities for effective and high-quality care.[21] The National Committee for Quality Assurance (NCQA) concludes that many hospital readmissions, especially those for same medical conditions, signal unsatisfactory care during hospitalization and can be prevented by improving patient care. However, one must note that readmission rate is

[21] National Committee for Quality Assurance. *Hospital Readmissions Report (2012)*. http://www.ncqa.org/portals/0/Publications/2012%20BI_NCQA%20ReAdMi%20_Pub.pdf

not a perfect marker for care quality, as many cases of readmission are unpreventable, such as cancer, chronic diseases, or accident after an admission for asthma. These special circumstances, however, only constitute a small fraction of total hospital readmissions.[22] In general, readmission rate is a good measurement of an ACO's healthcare quality.

The validity of using inpatient healthcare expenditure as the dependent variable is also self-explanatory. Empirically, hospital readmission rate will only influence the costs related to inpatients – those who stayed in hospital for long-term treatment for more than 72 hours. A reduced hospital readmission rate will reduce the repetitions in physical examinations, diagnosis, treatment and possible surgery operations performed on the same person. A decreases in these repetitive services will lead to a decrease in overall inpatient healthcare costs.

The model used in this thesis also controls three main categories of variables that would potentially affect the validity of results. One important confounding variable is the scale of ACOs, measured as the total number of Medicare beneficiaries served by each ACO. As larger ACOs have more efficient administrative and operational structures, they may control their cost more efficiently than smaller ACOs due to their scale of business. The study also controls the ACO's professional capacities, including the total number of physicians and the total number of auxiliary staff affiliated to each ACO. The third category of controlled variable is the ACO's technical capacities, including the total number of computed tomography (CT), total number of magnetic resonance imaging (MRI), and total number of primary care services performed by each ACO per year. The fourth category of controlled variables are patient characteristics, including racial composition, age, region, and patient self-evaluation score. The following table

[22] National Committee for Quality Assurance. *Hospital Readmissions Report (2012)*. http://www.ncqa.org/portals/0/Publications/2012%20BI_NCQA%20ReAdMi%20_Pub.pdf

demonstrates a full list of capacity and demographic variables controlled in this conceptual model:

TABLE 1: RISK-ADJUSTING VARIABLES USED IN THE MODEL

Category	Variable Name	Description
Scale	N_AB	Total number of assigned beneficiaries to an ACO
Technical Capacity	P_CT_VIS	Total number of computed tomography (CT) events per 1,000 person years.
	P_MRI_VIS	Total number of magnetic resonance imaging (MRI) events per 1,000 person years.
	P_EM_PCP_Vis	Total number of primary care services provided by a primary care physician (PCP) per 1,000 person years.
	P_EM_SP_Vis	Total number of primary care services provided by a specialist per 1,000 person years.
	P_Nurse_Vis	Total number of primary care services provided by a nurse practitioner (NP), physician's assistant (PA), or clinical nurse specialist (CNS) per 1,000 person years.
Personnel Capacity	N_PCP	Number of participating PCPs
	N_Spec	Number of participating specialists
	N_NP	Number of participating nurse practitioners
	N_PA	Number of participating physician assistants
	N_CNS	Number of participating clinical nurse specialists
Patient Characteristics	Region	Four dummy variables: "Northeast", "South", "Midwest", "West", "Others"
	Race	Percentage of Whites among beneficiaries
	Age	Percentage of Persons over 75 years of age among beneficiaries

To sum up, the overall model to evaluate the impact of inpatient expenditure on cost reduction are represented as:

$$\textit{Per Capita Inpatient Expenditure} = \beta_0 + \boldsymbol{\beta_1 Readm\_Rate} + \beta_2 N\_AB + \beta_3 P\_CT\_VIS + \beta_4 P\_MRI\_VIS + \beta_5 (P\_EM\_PCP\_Vis + P\_EM\_SP\_Vis + P\_Nurse\_Vis) + \beta_6 (N\_PCP + N\_Spec) + \beta_7 (N\_NP + N\_PA + N\_CNS) + \beta_8 P\_EDV\_Vis\_HOSP + \beta_9 Region + \beta_{10} Age + \beta_{11} Race + \beta_{12} Year\_in\_Operation$$

Note:

1. $\beta 5$ captures the effect of the total number primary services offered by all providers (primary care physicians, specialists, nurse practitioners and physician assistants) to beneficiaries in a given year.

2. $\beta 6$ captures the effect of the total number of physicians (including primary care physicians and specialists) on the inpatient cost.
3. $\beta 7$ captures the effect of total number of auxiliary personnel (including physician assistants, nurse practitioners, and clinical nurse specialists) on inpatient cost.

Based on the model above, this study estimates each ACO's per capita inpatient expenditure as a function of readmission rate, total number of beneficiaries, total number of CTs per 1,000, total number of MRIs per 1,000, total number of primary care services per 1,000, total number of physicians, total number of auxiliary professionals, region, proportion of persons over 75 years of age, proportion of non-Hispanic white, and years in business.

One possible problem in this model is the apparent collinearity between variables. It is possible that more services provided by primary care physicians might lead to less services provided by nurse practitioners/physician assistants. It is also possible that more CTs per 1,000 is positively correlated with more MRIs per 1,000 (because of they are both necessary radiological procedure). However, collinearity in this case is not a serious problem because no variable is collinear with the variable of interest (readmission rate) and will not affect the validity of its coefficients and parameters.

DESCRIPTION OF DATA

This study consolidates a working database from two separate datasets downloaded from the Center for Medicare and Medicaid Services (CMS). The first dataset (ACO_SSP_PUF.xls) captures the general characteristics of ACOs, including size, number of medical professionals, and variables regarding an ACO's technical capacity (number of CT, MRI, Emergency Room). The second spreadsheet (ACO_MSSP_Performance.xls) shows the performance results of ACOs,

including the total and per capita total and inpatient expenditures of ACOs at the end of the year. Each dataset contains two spreadsheets showing values in 2013 and 2014 respectively.

After cleaning the dataset, the 2014 data contains 333 observations. The 333 observations represents 333 Medicare ACOs recognized by the CMS as of October 2015. The 2013 data contains 220 observations, representing the 220 operating Medicare ACOs in Fiscal Year 2013. The difference in the number of observations is due to the formation of 113 new ACOs in 2014. Since the two-year data covers the entire population, no selection/sampling process is needed.

Some ACOs (19 in total for two years) have missing value in some variables; the original file labelled missing values as "0" and many possibly generate bias toward zero; this study replaces these values manually with a "." to better capture them as "missing values" in STATA. The independent and dependent variables included in this model a shown in the following list:

TABLE 2. VARIABLES OF INTEREST

Variable	**Definition**
Readm_Rate	Readmission rate per 1,000
QualScore	Quality score given by patients
N_AB	Total number of beneficiaries in the ACO
N_Docs	Total number of medical professionals in the ACO
p_edv_vis_hosp	Emergency Room utility rate
p_ct_vis	CT Service utility rate
p_mri_vis	MRI Service utility rate
South	= 1 if ACO is in the South
Midwest	= 1 if ACO is in the Midwest
West	= 1 if ACO is in the West
Other_Region	= 1 if ACO is in Puerto Rico
Race	= 1 if the ACO served a majority-minority patient population

Table 3 shows the geographical and demographical distribution of the 333 operating ACOs in the United States. It shows the South has the greatest concentration of Medicare ACOs (136),

followed by Northeast (75), Midwest (67), and West (53). The majority of ACOs serve a white-majority population (306), while less than ten percent of all ACOs (27) serve an ethnically diverse community. The starting year of Medicare ACOs are evenly distributed, and the number of ACOs that started in 2012, 2013 and 2014 is approximately equal (111, 103 and 119 respectively).

TABLE 3. DEMOGRAPHIC, GEOGRAPHIC AND TIME VARIATIONS AMONG MEDICARE ACOS

Region	Number	Demographic Profile	Number	Starting Year in business	Number
Northeast	75	ACOs serving a white majority*	306	Starting in 2012	111
South	136				
Midwest	67	ACOs serving a non-white majority	27	Starting in 2013	103
West	53				
Others*	2	**Total**	333	Starting in 2014	119
Total	333				

** Puerto Rico only.
* Here "majority" means absolute majority, or 60% of total population self-identify as non-Hispanic whites. This criteria is based on the terminology of United States Census Bureau on its Metropolitan Statistical Area (MSA) surveys.[23]

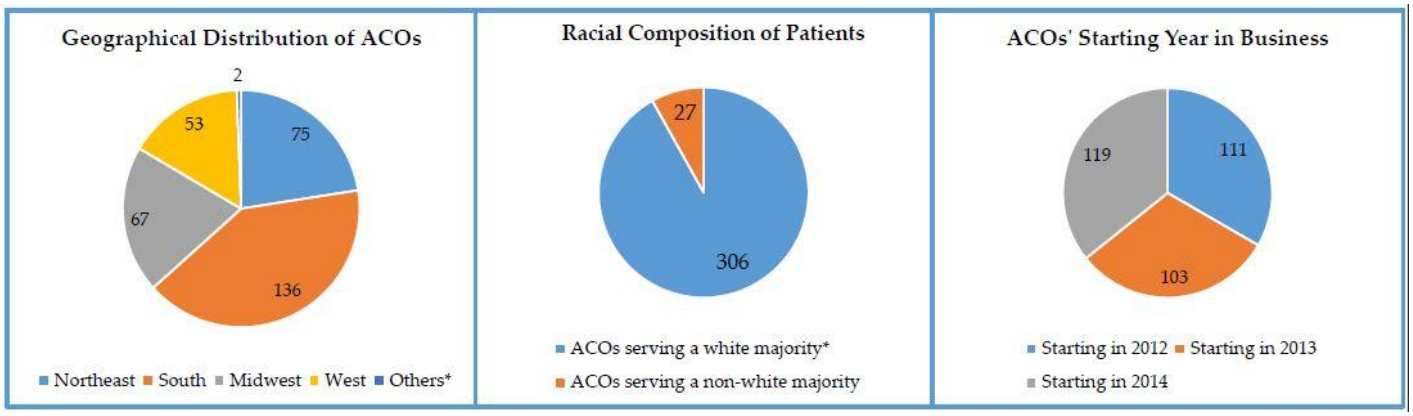

Figure 2. Geographical Distributions, Demographics and Starting Year of ACOs

[23] U.S. Census Bureau. Overview of Race and Hispanic Origin: 2010. Retrieved online at: http://www.census.gov/prod/cen2010/briefs/c2010br-02.pdf

Table 4 captures major descriptive statistics in this model, including their mean, standard deviation, median, 1st and 3rd quartiles, smallest and largest values of variables in the dataset. The summary statistics demonstrate two issues that needs special attention. First, the distribution of certain variables is not strictly normal. The per capita inpatient expenditure is apparently skewed to the left, and the CT and MRI utility rate has a slight negative-skewed distribution. The normality of these variables needs to be tested and adjusted. Second, there are a large portion of zero values in the N_NP (Number of Nurse Practitioners) and N_PA (Number of Physician Assistants), which raises concerns on whether these zero values are caused by censoring or truncation of data. These problems will be further discussed in the future analysis of data.

TABLE 4. SUMMARY STATISTICS OF VARIABLES IN THE MODEL

Variable Name	**Obs**	**Mean**	**Std. Dev.**	**Min**	**25%**	**75%**	**Max**
Per Capita Inpatient Expenditure	333	3378.259	1043.783	1190.139	2720.305	3750.392	9611.424
Log of Per Capita Inpatient Exp.	333	17.49787	.6974973	15.92038	16.99913	17.92488	20.00381
Readmission Rate/1,000	333	172.3227	27.12269	112.1417	155.416	188.9851	257.7472
Patient Evaluation Score	206	.8307676	.1730023	.6407366	.8303571	.9045759	.9541295
No. of Primary Care Physicians	333	127.964	158.9554	0	35	157	1,216
No. of Specialists	333	257.2553	447.668	0	18	297	3,952
No. of Nurse Practitioners	333	50.29129	66.78077	0	8	66	511
No. of Physician Assistants	333	1.009009	2.094868	0	0	1	17
CT Utility Rate	333	715.1251	137.2553	289.7378	634.0666	796.9823	1272.255
MRI Utility Rate	333	285.7646	64.21038	94.21404	240.9235	319.667	519.0711

This study conducts two exploratory analysis of this data by performing simple regressions on the data for 2013 and 2014 separately, in order to obtain a rough impression of the mutual relationships among variables. For both years, the statistical output shows a strong and statistically significant relationship between readmission rate and per capita inpatient expenditure

(p<0.001). In both years, CT Utility Rate (p<0.01), racial composition (p<0.1), and age (p < 0.01) shows statistically significant correlation with readmission rate. The outcome shows some preliminary evidence that lower readmissions can lead to lower per capital inpatient costs. It also shows that patient demographics and technical capacity have some impact on an ACO's health expenditure. Starting year in business is associated with an ACO's expenditure in both years, which apparently indicates that more experience will help businesses reduce health expenditures.

TABLE 5. EXPLORATORY ANALYSIS OF DATA

	Coefficient	**p-value**
Readmission Rate	19.03**	0.000
	(2.04)	
Number of Beneficiaries	-0.0067*	0.105
	(0.0041)	
Technical Capacity		
CT Utility Rate	2.50**	0.000
	(0.42)	
MRI Utility Rate	-1.77	-2.380
	(0.75)	
Professional Capacity		
Total Number of Physicians	0.14	0.277
	(0.13)	
Total Number of Auxiliary Staff	-0.66	0.568
	(1.15)	
Demographic Characteristics		
Percentage of non-Hispanic White	-4.98*	0.085
	(2.88)	
Percentage of patients over 75 years	35.54**	0.000
	(6.42)	
Year in Operation		
Start in 2013	-5.37*	0.952
	(88.86)	
Start in 2014	25.09	0.773
	(86.87)	
Region		
South	-167.47*	0.091
	(98.74)	
Midwest	-77.81	0.487
	(111.70)	

West	632.24** (118.92)	0.000
R^2	0.6373	
Adjusted R^2	0.6225	

*** Statistically significant at 5% level.*
** Statistically significant at 10% level.*

This study conducts two multivariate linear regressions on the data for 2013 and 2014 separately. For both years, the statistical output shows a strong and statistically significant relationship between readmission rate and per capita inpatient expenditure ($p<0.001$). In both years, CT Utility Rate ($p<0.01$), racial composition ($p<0.1$), and age ($p < 0.01$) shows statistically significant correlation with readmission rate. The outcome shows some preliminary evidence that lower readmissions can lead to lower per capital inpatient costs. It also shows that patient demographics and technical capacity have some impact on an ACO's health expenditure. Starting year in business is associated with an ACO's expenditure in both years, which apparently indicates that more experience will help businesses reduce health expenditures.

The regression coefficients of variables in 2013 and 2014 have a visible difference. Holding others equal, the readmission rate, age and year in operation have a stronger impact on inpatient expenditure in 2013 than in 2014. In contrast, CT utility rate and race show a stronger effect on expenditures in 2014 than in 2013. Nonetheless, further statistical tests are required to examine whether the regression coefficients on the two annual datasets indicate a structural break in time series.

At the current stage, this study has completed an experimental probe on the relationship between readmission rate and inpatient expenditures for Medicare ACOs. It examines the previous literatures on Medicare ACOs and summarizes the major findings on the ACOs' characteristics. It also provides a theoretical framework that explains the mechanism how

readmissions impact on health expenditure. It creates a multivariate linear model to estimate the Medicare ACOs' expenditures and uses yearly data in 2013 and 2014 to test the validity of the model. The multivariate regression yields statistically significant results for both years, which shows some evidence that that readmission rate is a good predictor for inpatient expenditure for Medicare ACOs. In the next section, the study will conduct a detailed data analysis that will focus on the following aspects to improve the strength of this research:

First, diversify the statistical model used to analyze the data. The next step will consolidate the datasets in 2013 and 2014 and create a two-year panel dataset. A fixed-effect model will be used to evaluate the readmission rate's effect on health expenditures across time. The next step will also examine whether the size of business will impact the observed correlation between readmission rate and health expenditure. A regression that includes the largest 50 Medicare ACOs for two years will be compared with the results of the entire population, which aims to examine whether scale of business will influence the slope coefficients.

Second, discussing the policy implications of the model. Based on the statistical results of data analysis, the next chapter will take measures to improve the explanatory framework that lower readmission rate will reduce an ACO's health expenditure. The study will also discuss how the outcome of the research would contribute to current healthcare reforms. The next chapters of this paper will also include a list of policy measures that aims to reduce readmission rates in Medicare ACOs.

Although this section only provides a preliminary and immature analysis on the correlation between readmission rates and health expenditures, the output shows statistically significant

results and suggested the research is moving toward a correct direction. It is hopeful that future research can yield more rigorous outcomes and provide better insights into the problem.

RESULTS

TABLE 6. MEDICARE ACOS POPULATION PARAMETER 2013 – 2014

Line Item	2013	2014	Δ Change
Total Number of ACOs	220	333	113
South	87	136	49
Northeast	65	75	10
Midwest	35	67	32
West	33	53	20
Total Number of Beneficiaries	3,675,263	5,329,831	1,654,568
White	2,892,882	4,509,107	1,616,225
Non-White	782,381	820,724	38,343
Total Number of MRIs	61,753,909	95,159,596	33,405,687
Total Number of CTs	151,028,779	238,136,663	87,107,884
Total Number of Physicians	96,559	128,278	31,719
Total Number of Auxiliaries	12,183	17,410	5,227

This chapter aims to improve the statistical instruments used to capture the relationship between readmission rates and total expenditure. The Table 6 above shows the qualitative statistics of Medicare ACOs. The total number of ACOs in operation increased by 113 in 2014 compared to 2013. The geographical distribution of ACOs did not show significant change in the two years. All regions show an increase in the number of ACOs, with the South constituting the largest share of Medicare ACOs (87 in 2013, 136 in 2014), followed by Northeast (65 in 2013, 75 in 2014), Midwest (35 in 2013, 67 in 2014), Midwest (35 in 2013, 67 in 2014) and West (33 in 2013, 53 in 2014). The total number of beneficiaries enrolled in an ACO also increased significantly by 1.65 million nationwide.

Demographically, in both years the ACO enrollees are predominately White, but the proportion of non-White enrollees decreased remarkably in 2014. Despite the increasing need for

cost-saving, the amount of services provided to patients grew disproportionately faster than the ACO participants. The number of CTs and MRIs, two indicator of medical services, increased by 33.4 million and 87.1 million respectively. The number of medical personnel in the ACOs also grew at a faster pace than participants, which shows an increase of 32% for physicians and 42% for auxiliary staff.

TABLE 7. MEDICARE ACOS CENTRAL TENDENCY, 2013 – 2014

	2013		2014		Δ Change	
Line Item	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**
Per Capita Expenditure	148.03	151.31	169.74	148.03	21.71	-3.28
Readmission Rate	3378.26	3162	3161.79	3163.34	-216.47	1.34
Number of Beneficiaries	16705.74	11383	16005.50	11219	-700.24	-164
White	13149.46	9076.5	13540.86	9188	391.4	111.5
Non-White	3556.28	2306.5	2464.64	2031	1091.64	-275.5
Total Number of MRIs	280.70	272.47	285.76	279.60	5.06	7.13
Total Number of CTs	686.494	680	715.13	697.10	28.636	17.1
Total Number of Physicians	438.9	203.5	385.22	173	-53.68	-30.5
Total Number Auxiliaries	55.38	27	52.28	23	-3.1	-4

The mean and median values of ACO characteristics in 2013 and 2014 also show significant variations. The mean per capita expenditure increased in 2014 compared to 2013, but the median expenditure decreased in 2014 compared to the previous year. The readmission rate showed the opposite trend – its mean value decreased while its median value increased in 2014 compared to 2013. Both the mean and median number of CT and MRI utilization increases in 2014 compared to the previous year. The ACOs' average size of personnel decreases in 2014 compared to 2013. From the two-year observation, we can see that the utilization of services increased, but the average number of medical professionals decreased.

TABLE 8. ALL MEDICARE ACOS REGRESSION RESULTS, 2013		
Variable	**Coefficients**	***p***
Readmission Rate	25.786 ***	0.000
	(3.0007)	
Number of Patients	-0.00929 **	0.046
	(0.0046)	
Number of Physicians	0.173	0.240
	(0.147)	
Number of Auxiliaries	-0.488	0.729
	(1.407)	
Number of CTs	1.861 ***	0.001
	(0.558)	
Number of MRIs	-0.778	-0.830
	(0.936)	
Proportion of White	-6.198 *	0.060
	(3.275)	
Proportion of Old Patients	38.359 ***	0.000
	(8.135)	
Start in 2012	286.401 **	0.008
	(107.278)	
****Statistically significant at 1% level.*		
*** Statistically significant at 5% level.*		
** Statistically significant at 10% level.*		

This study also performs a multivariate regression of multiple independent variables (readmission rate, number of patients, number of medical personnel, number of services, and demographic factors) on expenditures in each year. In 2013, the result shows that expenditure is positively correlated with readmission rate ($p<0.001$). One point increase in readmission per 1,000 patients leads to 24.786 dollars in per-capita medical expenditure. Expenditure is also negatively correlated with the size of population served by the ACO. An increase of 1,000 enrollees will reduce its per capita expenditure by 9.29 dollars. Between the two services measured by the study, only the number of CTs shows a positive correlation with expenditure ($p<0.001$). Demographically, larger proportion of white patients decreases expenditure ($p<0.1$),

while larger proportion of older patients increases expenditure (p<0.05). Most regression results meet the expectation of the study's initial assumption.

TABLE 9. ALL MEDICARE ACOS REGRESSION RESULTS, 2014

Variable	Coefficients	p
Readmission Rate	19.122 *** (2.178628)	0.000
Number of Patients	-0.008 * (0.004401)	0.076
Number of Physicians	0.132 (0.139171)	0.342
Number of Auxillaries	-0.409 (1.235391)	0.741
Number of CTs	1.806 *** (0.431885)	0.000
Number of MRIs	-0.601 (0.751455)	0.424
Proportion of White Patients	-5.341 * (3.042746)	0.080
Proportion of Old Patients	41.055 *** (6.691723)	0.000
Start in 2013	13.724 (94.68023)	0.885
Start in 2014	52.19702 (92.69918)	0.574

****Statistically significant at 1% level.*
*** Statistically significant at 5% level.*
** Statistically significant at 10% level.*

The regression results in 2014 are very similar with the 2013 results. The outcome shows significant correlation between expenditure and readmission rates, but the actual impact of readmissions on expenditure is smaller than 2013. Expenditure is also negatively correlated with the number of CTs. Demographically, the proportion of White patients has a positive impact on expenditure, while the proportion of senior citizens has a positive impact on medical spending.

It is noticeable that in both years, the length of operation in business does not show a significant correlation with expenditure. Previous studies on the hospital and physician level shows that experience matters – the longer a hospital stay in business, the more cost it would save during its treatment of patients. However, from the current observation, we do not seem to observe this effect. In both years, year in business does not have a statistically significant effect on expenditures. The reason for this insignificant result will be discussed in later chapters.

TABLE 10. LARGEST 50 MEDICARE ACOS REGRESSION RESULTS

	2013		2014	
Variable	**Coefficients**	***p***	**Coefficients**	***p***
Readmission Rate	19.255 *** (4.367)	0.000	22.452 *** (4.418)	0.000
Number of Patients	-0.00297 (0.00326)	0.367	-0.004 (0.003)	0.319
Number of Physicians	-0.020 (0.106)	0.854	-0.013 (0.128)	0.92
Number of Auxillaries	1.497 (1.136)	0.195	0.353 (1.268)	0.782
Number of CTs	-0.749 (0.813)	0.362	0.153 (0.927)	0.870
Number of MRIs	2.431 * (1.379)	0.086	1.132 (1.664)	0.5
Proportion of White Patients	-14.202 (9.739)	-1.46	-5.587 (12.553)	0.659
Proportion of Old Patients	34.889 ** (15.421)	0.029	15.204 (17.828)	0.399
Start in 2012	138.254 129.951	0.294	-	-
Start in 2013	-	-	149.238 (129.854)	0.257
Start in 2014	-	-	53.648 (155.637)	0.732

****Statistically significant at 1% level.*
*** Statistically significant at 5% level.*
** Statistically significant at 10% level.*

In order to examine whether an ACO's size has an impact on its annual expenditure, this study isolates the 50 largest ACOs in both years by the number of patients they served and performed regression of the independent variables on expenditure. The two regressions yield similar results. In the largest 50 ACOs, the amount of service and demographic factors no longer show statistical significance. The only significant variable is readmission rate – for each unit increase of readmission rate per 1,000 incidents, the expenditure increased by 19.255 and 22.452 respectively. In 2013, the number of MRIs and the proportion of senior citizens also show some impacts ($p<0.1$), but their levels of statistical significance are not strong enough.

TABLE 11. ALL MEDICARE ACOS FIXED-EFFECT REGRESSION RESULTS, 2013 – 2014

Variable	**Coefficients**	***t***	***P***
Readmission Rate	21.073*** (1.748)	12.05	0.000
Number of Patients	-.00685** (.00314)	-2.18	0.046
Number of Physicians	.1447 (.101)	1.43	0.152
Number of Auxillaries	-.799 (.927)	-0.86	0.389
Number of CTs	1.861*** (.341)	5.45	0.000
Number of MRIs	-.666 (.588)	-1.13	0.258
Proportion of White Patients	-5.583** (2.233)	-2.50	0.013
Proportion of Old Patients	33.879*** (4.844)	6.99	0.000

****Statistically significant at 1% level.*
*** Statistically significant at 5% level.*
** Statistically significant at 10% level.*

In order to eliminate the effect of time in the regression process, this study performs a time-demeaning, fixed-effect multivariate regression of the same variables on per capita

expenditure. The result shows more statistical significance than the year-by-year result. The readmission rate still has a strong correlation with expenditure ($p<0.001$). The result shows that one unit increase in readmissions rate increases expenditure by 21.07 dollars. The number of patients are negatively correlated with expenditure ($p<0.05$), and the number of CT services impose a positive effect on expenditure ($p<0.001$). Demographically, more White patients lead to a decrease in per capita expenditure ($p<0.05$), and more elder patients lead to an increase in per capita expenditure ($p<0.001$). The result of fixed-effect regression shows strong similarity with the pooled regression outcomes in 2013 and 2014.

DISCUSSION AND REFLECTION

This study performs an analysis to examine whether readmission rate has an impact on the ACOs' total expenditure. The data analysis includes a multivariate regression on each year's ACO performance and cost data, as well as on the 50 largest ACOs in each year. The study also applies a fixed effects model to examine the 2-year panel data on the ACO's cost and performance in order to control the individual heterogeneous factors existing in each specific ACO group. By conducting these three types of analysis, we can observe the pattern of correlation between cost and readmission rate by each year and size, but can also achieve a holistic view on how well ACO performs as a new healthcare delivery model.

The first observation we gain from this analysis is that a highly statistically significant correlation exists between readmission rate and per capital expenditure. It shows that regardless of year and group size, lower readmission rate will always lead to lower health expenditure shown in the year-end performance and cost metrics. The correlation persists even when the individual heterogeneity was controlled in the fixed-effects model. The result strengthens the

basic underlying assumption that reducing hospital readmission rate can effectively save healthcare costs.

The second observations from data analysis result is that demography has a statistically significant impact on the health expenditure of ACOs. For the population enrolled in an ACO, the proportion of White patients is negatively correlated with the per capita total health expenditure, while the proportion of older-age patients are positively correlated with healthcare cost. The reason of this feature is self-explanatory: White patients generally belongs to a higher socioeconomic status and have healthier conditions, and their healthcare costs are relatively lower than patients of other ethnic groups. Elder patients have a higher risk of exposure to various diseases, and their healthcare cost will correspondingly higher. The fact that different demographic groups generate healthcare cost differently have strong policy implications, which will be discussed later.

Third, the readmission rate's impact on expenditure varies tremendously by size and year. Compared to 2013, Medicare ACOs in 2014 show stronger correlation between readmission rate and per capita expenditure. The size of ACOs can also impact the extent of correlation between two variables. In the same year, readmission rate have a relatively smaller impact on healthcare expenditure in larger ACOs (top-50 ACOs by population served). However, the mechanism of how size can influence an ACO's cost-saving performance remains an interesting topic to be addressed in future studies.

However, the design of this study is far from perfect and contains many methodological issues. First, restrained by the limitations of the dataset, the number of variables controlled in the model is not sufficient. The potential failure to control confounding variables may cause

inaccuracy of coefficients and standard errors in the regression outcomes. Another potential shortcoming of this study is the small number of observations in the data. There are only 295 Medicare ACOs in 2013. The small sample size will undoubtedly affect the validity of the estimation.

Additionally, as a relatively new delivery model, only two years of data (2013 and 2014) is available to the public. The limited time period for Medicare ACO's implementation makes it difficult to evaluate the time trend of the ACO's cost-saving efforts. When more years of data is released for public use, future research can explore further into how the length of operation influences the observed correlation between readmissions and costs.

POLICY IMPLICATIONS AND CONCLUSION

This study have important implications for policymakers. It supports the cost-saving effects of the ACO model and established a link between readmissions rates and healthcare expenditure. Facing the increasing health cost starting in the 2000s, health officials should make effective efforts to reduce the incidents of readmissions in Medicare ACOs. The CMS should provide better incentives to encourage hospitals reduce the number of patients readmitted to the same hospitals and impose punishment measures for those healthcare providers that shows an excessively high readmissions rate. This study also shows the importance of promoting Electronic Health Records (EHRs). By implementing EHRs among hospitals, providers can reduce the unnecessary administrative costs generated during the patient readmission.

This study has also highlighted the importance of value-based payment model. It shows that by linking reimbursement with performance, healthcare providers would have the incentive to improve the quality of care and enhance patient satisfaction. Medicare ACOs, although only

being implemented for two years, has demonstrate significant impact in improving provider performance and reducing unnecessary cost at the same time. Policymakers should continue to improve the performance metrics in evaluating each ACO's performance in order to better capture the providers' quality of care. Health officials should also develop new innovative delivery models in Medicare payment aiming to better incentivize healthcare providers in performance improvement and cost reduction.

This study is the first quantitative analysis of Medicare ACOs in 2013 and 2014, and it provides a rough picture on how ACOs reduces health costs from an econometric perspective. Although this study only provides a preliminary probe into the cost-saving mechanism of Medicare ACOs, future studies can hopefully address this study's shortcomings in data sources and methodology. It is hopeful that this study can provide a modest contribution to the ongoing policy discussion of healthcare reform and payment model transformation.

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