Prospects for Using All-Inclusive Service Price Transparency to Address High Prices for Complex Health Care Services

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Abstract

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Private insurance prices for health care services in the United States often have high variation across providers and insurers that are not justified by variation in provider quality. Prices were historically difficult or impossible to obtain for enrollees who wanted to consider price information before receiving care. In the past quarter century, public and private stakeholders implemented many initiatives to make service prices transparent and thereby enable patients to price shop. Pursuant to a 2019 Presidential Executive Order, the

Centers for Medicare and Medicaid Services established price transparency requirements for hospitals including all-inclusive "service package" price disclosures that include a primary service and customarily billed ancillary services. In this dissertation, I studied the potential for using all-inclusive service price estimates to enable price shopping for procedures with complex billing focusing on gastrointestinal endoscopies (GIEs). I investigated how contextual factors affect the potential effectiveness of all-inclusive service price transparency: (1) how billing variation and clinical uncertainty affect the potential to anticipate all-inclusive service spending, (2) how omitting ancillary services and independent billing entities from estimates of GIE service package prices affect price comparisons between hospital outpatient departments (HOPDs) and ambulatory surgery centers (ASCs) and (3) how GIE spending amounts and utilization characteristics are affected by referring of GIEs within vertically integrated health systems and by endoscopist self-referring. I evaluated 2012-2019 GIE referrals and claims data from insurer Kaiser Permanente Washington (KPWA) in parts of Washington State and northern Idaho where KPWA operates only as a private insurer that contracts with non-KPWA GIE facilities (i.e., where KPWA is not operating as a staff model Health Maintenance Organization that Kaiser Permanente is known for). In the studied KPWA subpopulation, expected and actual all-inclusive service package spending had substantial differences, and regression analyses that I used to forecast GIE service package spending had substantial errors between predicted and actual spending. In all years, HOPDs had higher all-inclusive GIE spending than ASCs and spending increased from 2012-2019 by $1115 at HOPDs and by only $108 at ASCs. Ancillary services and independent billing entity spending was a small portion of total spending, changed modestly over time, and was not sufficiently large that omitting them would make HOPDs appear price competitive with ASCs. All-inclusive GIE service spending was substantially higher for packages preceded by a vertically integrated GIE referral or endoscopist self-referral than packages preceded by a non-vertically integrated GIE referral, which was due to vertically integrated GIE referrals and endoscopist self-referrals being referrals to HOPDs at twice or higher rates than non-vertically integrated GIE referrals. My findings suggest that all-inclusive service price transparency as currently implemented is unlikely to help reduce spending on complex services. To reduce spending on health care services that privately insured Americans might price shop for, stakeholders could explore how to increase private payers' use of unconventional first-dollar coverage insurance benefits that have achieved substantial savings by increasing use of lower priced providers but have not been widely adopted.   Lawmakers and regulators could also consider proposals to cap commercial insurance payments as a percentage of Medicare payments to prevent high outlier prices.

Table of Contents

List of Figures

List of Tables

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Chapter 1. Introduction

1.1 Background

High service prices are a major cause of higher health care spending in the United States compared to peer nations (Anderson, Reinhardt et al. 2003, Papanicolas, Woskie and Jha 2018, Anderson, Hussey and Petrosyan 2019, Scanlon, Shi and Burns 2025). Prices are highest for private health insurance, which covers approximately 60% of Americans in 2026 and will make up a projected 40.8% of $4.4 trillion of health insurance spending on healthcare delivery in 2026 including administration (Keehan, Madison et al. 2025, National Health Expenditure Accounts Team 2025, National Health Expenditure Accounts Team 2025). Private Insurers and providers negotiate prices, and providers with greater bargaining power can demand higher prices (Cooper, Craig et al. 2019), although there is generally no association between healthcare costs and quality that might justify the high price variation of many services (Hussey, Wertheimer and Mehrotra 2013, Barrette and Kennedy 2016, Roberts, Mehrotra and McWilliams 2017, Unruh, Zhang et al. 2020). As a result, price variation explains half of the per beneficiary spending variation across regions for the privately insured, but only explains 13% for Medicare which has administratively set prices (Cooper, Craig et al. 2019).

Price variation creates the potential for substantial savings if patients use lower priced providers. Services with the greatest potential for price shopping have been called *shoppable* defined as services that can be shopped for in advance, have a sufficient number of provider options in a geographic market to generate price variation, have price information available, and have quality information available or a reasonable expectation that quality does not vary much (White and Eguchi 2014, Frost and Newman 2016). In two populations of commercial insurance enrollees, shoppable service spending's share of total spending was estimated to be 35% (White and Eguchi 2014) and 43% (Frost and Newman 2016) when shoppable services were more simply defined as services that could be scheduled in advance and limited mostly to services that had the highest population spending due to high prices and/or high volume. Services that have been identified as shoppable include some outpatient office visits (e.g., evaluation and management visits, psychotherapy, and physical therapy), laboratory and pathology tests (e.g., blood tests, urinalysis, and basic metabolic panels), radiology tests (e.g., x-rays, magnetic resonance imaging (MRI) scans, computed tomography (CT) scans, ultrasounds and mammograms), outpatient procedures (e.g., knee and shoulder arthroscopy, upper and lower gastrointestinal endoscopies, laparoscopic gallbladder removal, cataract removal, tonsillectomy, carpal tunnel release, and hernia repair), and inpatient procedures (total hip and knee replacements, vaginal and cesarean deliveries, and spinal fusions) (Sinaiko and Rosenthal 2016, Centers for Medicare and Medicaid Services 2019). Outpatient shoppable services comprised 80.4% (Frost and Newman 2016) and 77.3% (White and Eguchi 2014) of total shoppable service spending in the aforementioned estimates.

Across five categories of shoppable services that patient might price shop for, the total possible insurer savings from price shopping in a local market was at least 30% of total spending for each category (Zhao and Berman 2023). For some services, spending per case would be reduced by over half If every patient paid no more than the median price for a service in a region (Brown 2018, Desai, Hatfield et al. 2019, Gruber 2021). To reduce spending on shoppable services, supporters of market-based reforms advocated for increased cost-sharing to give enrollees “skin in the game” and for patient-facing price transparency including disclosure of historically confidential negotiated billing code prices to enable patients to price shop (Bloche 2006, Ginsburg 2007, Yong, Saunders et al. 2010, Steinmetz and Emanuel 2013, Reinhardt 2014). By enabling at least a minority of enrollees to be price conscious and informed of price differences between providers, price transparency could potentially stimulate price competition that could reduce spending for all enrollees.

Early patient-facing price transparency developments included regulations adopted to increase price transparency in over 30 states between 2003 and 2010 (Brown 2018, Christensen, Floyd and Maffett 2020, Murray, Tessitore et al. 2020), private sector initiatives by employers, insurers, and third party firms (Whaley, Schneider Chafen et al. 2014, Wu, Sylwestrzak et al. 2014, Whaley 2015, Desai, Hatfield et al. 2016, Sinaiko, Joynt and Rosenthal 2016, Desai, Hatfield et al. 2017, Lieber 2017), and a provision in the Patient Protection and Affordable Care Act of 2010 that required hospitals disclose standard charges. Beginning in 2003, private insurers began offering internet-based transparency tools which usually allow enrollees to obtain personalized out-of-pocket cost estimates by incorporating real-time benefits information and the enrollee’s spending in the current plan year toward their deductible and out-of-pocket maximum (White, Ginsburg et al. 2014). In the early 2010s, the share of the privately insured population with access to a patient-facing price transparency tool increased rapidly from approximately one-third in 2011 to over two-thirds in 2013 (White, Ginsburg et al. 2014).

Studies of early price transparency tools report mixed effects for multiple spending outcomes. Individuals who used a price transparency tool before receiving a service had varied small to medium savings or no savings depending on the service compared to non-searchers or a control population adjusted for confounding factors (Whaley, Schneider Chafen et al. 2014, Whaley 2015, Sinaiko, Joynt and Rosenthal 2016, Desai, Hatfield et al. 2017). Price shoppers saved the most before receiving higher cost imaging scans (MRIs and CT scans): 12-15% savings (>$100) per scan (Whaley, Schneider Chafen et al. 2014, Whaley 2015, Sinaiko, Joynt and Rosenthal 2016, Desai, Hatfield et al. 2017). Price shoppers for office visits saved 1% in one study (Whaley, Schneider Chafen et al. 2014) and had no savings in another study (Desai, Hatfield et al. 2017). In one study, persons who used a price transparency tool before a sleep study chose providers who had a lower relative price percentile, but savings did not reach statistical significance $103.50 (6%) (p=0.06) (Sinaiko, Joynt and Rosenthal 2016). Except for imaging scans, shoppers did not choose lower price providers or realize savings for other services: carpal tunnel release, cataract removal, colonoscopy, upper endoscopy, and mammogram.

Studies that estimated how much individual payers introducing a price transparency tool affected service prices for entire populations (including non-searchers) report mixed population-wide effects. Two studies have evaluated the effects of individual payers making price transparency tools available to their populations with comparisons to control populations. One study found no effect on quarterly spending on shoppable services combined or separately for lab tests, office visits, or advanced imaging and no effect on total outpatient care quarterly spending (Desai, Hatfield et al. 2017). The second study found that the tool introduction modestly increased total annual outpatient spending $59 (2.9%) and out-of-pocket outpatient spending $18 (3.6%) (Desai, Hatfield et al. 2016).

Three studies have evaluated the effects of price transparency tools that affected multiple payers in the same market simultaneously. The staggered nationwide adoption of a price transparency web tool by many self-insured employers over time reduced laboratory test prices 1.7% for every 10 percentage point increase in tool access in a geographic market, but did not reduce prices for more differentiated office visits (Whaley 2019). The introduction of New Hampshire's public price transparency website *HealthCost* that includes all insurers in the state reduced medical imaging visit costs 3% and out-of-pocket costs 11% over 2007-2011 for imaging codes on the website compared to imaging codes that were not on the website (Brown 2018). In 2018 and 2019, an online advertising campaign promoted *HealthCost*, which increased traffic to the website, but did not affect spending on the services targeted in the campaign: imaging services, physical therapy, and emergency department visits (Desai, Shambhu and Mehrotra 2021). Although emergency services are generally not thought of as shoppable, emergency department visit is one of the most common price transparency tool search terms (Mehrotra, Brannen and Sinaiko 2014), which plausibly follows from people generally being aware that emergency departments are an expensive site of care that can have high out-of-pocket costs.

Price transparency could also affect spending if gaining price information affected service utilization. Price shoppers might obtain price estimates and decide to forego receiving an expensive service or decide to receive a service that is more reasonably priced than expected. Most studies that evaluated changes in utilization after individuals price shopped or gained access to price information did not find an effect on utilization (Wu, Sylwestrzak et al. 2014, Desai, Hatfield et al. 2017, Desai, Shambhu and Mehrotra 2021, Whaley, Sood et al. 2021). In the study that found access to a price transparency tool increased outpatient spending compared to a control population, access to the tool also increased hospital outpatient department (HOPD) services utilization by 0.06 (4.1%) professional fee claims among those who had at least one professional claim in both the pre-tool access and post-tool access years (Desai, Hatfield et al. 2016). Since HOPDs generally have higher prices than freestanding facilities for a given service (Burleson, Davenport et al. 2025, Lou, Linehan et al. 2025), HOPD utilization was used as a proxy for switching to lower priced providers, so the result is contrary to the effect hoped for price transparency.

Critically, price transparency effects have been constrained by low rates of tool use. Several studies report that approximately 10% of a population with access actually used a tool or sought price information at least once in a year (Desai, Hatfield et al. 2016, Desai, Hatfield et al. 2017, Gourevitch, Desai et al. 2017, Lieber 2017, Gourevitch, Chien et al. 2021). Other studies report lower use rates, ~1.6-3.5% (Sinaiko, Joynt and Rosenthal 2016, Sinaiko and Rosenthal 2016, Gourevitch, Desai et al. 2017). Lower rates are consistent with national survey findings that only 3% of respondents had compared prices among providers before their last healthcare encounter (Mehrotra, Dean et al. 2017).

In the greatest expansion of healthcare services price transparency to date, a 2019 Presidential Executive Order mandated nationwide price transparency for non-federally owned hospitals including both inpatient and outpatient services, beginning in 2021, and for private insurers, beginning in 2022 (Centers for Medicare and Medicaid Services 2019, Department of Health and Human Services 2019, Trump 2019, Internal Revenue Service, Employee Benefits Security Administration and Department of Health and Human Services 2020), using statutory authority from the Patient Protection and Affordable Care Act (Centers for Medicare and Medicaid Services 2019, Internal Revenue Service, Employee Benefits Security Administration and Department of Health and Human Services 2020). The hospital mandate instructs hospitals to disclose all negotiated private insurance billing code prices as well as provide "consumer-friendly" all-inclusive price estimates of 300 shoppable "service packages" where a package includes a service's primary billing code and any "customarily billed" ancillary codes (Centers for Medicare and Medicaid Services 2019). The 300 service packages include 70 mandatory packages with primary service codes specified by the Centers for Medicare and Medicaid Services (CMS) and 230 that each hospital chooses. Excluding prescription drug spending, the 70 mandatory services were 11.8% and 15.6% of total and out-of-pocket employer sponsored insurance spending in 2017 (Bloschichak, Milewski and Martin 2020) and were 10.0% of commercial insurance spending in a 2012-2018 dataset (Gruber 2021). Hospital compliance has not been universal (Mead and Ibrahim 2024, Milosavljevic, Milligan and Lam 2024), but compliance will likely increase following a 2025 executive order that increased noncompliance penalties and enforcement (Trump 2025).

While price shoppers can directly compare individual primary service code price disclosures across providers, estimates of all-inclusive service package prices are not always comparable because some services can have treatment and billing variation for any individual provider, as well as, across providers. The billing codes that make up a service package may vary because recipients of a primary service code have different ancillary service needs; providers treat equivalent cases differently; or bill coders bill equivalent treatments with different codes (Burks, Shields et al. 2022). The hospital price transparency mandate allows for that variation in service package price estimates because CMS explicitly declined to specify how hospitals should determine which ancillary services are customarily provided with a shoppable primary service (Centers for Medicare and Medicaid Services 2019). In addition, the statutory authority for the mandate does not apply to non-hospital providers, so CMS cannot require hospitals to include estimates of how much independent billing entities (IBEs) contribute to service packages. The omission of IBE spending causes underestimates of total service spending and distorts comparisons with providers in non-hospital settings when price estimates are available for those providers.

There is limited evidence about all-inclusive shoppable service spending and whether all-inclusive price estimates can improve price transparency and shoppability for complex services. In this dissertation, I study factors that may affect the potential for using all-inclusive service price estimates to price shop for services with complex billing. I analyze referral authorizations and service packages of the five most common gastrointestinal endoscopies (GIEs), which are included in the 70 shoppable service packages that CMS requires every hospital disclose (Common Procedural Terminology (CPT) codes 43235, 43239, 45378, 45380, and 45385). GIEs are attractive to study because they have multiple characteristics that contribute to service package price variation for complex services. They are commonly performed with multiple ancillary codes billed by the primary provider organization or IBE(s) including anesthesia, pathology, and injectable drugs subject to varied provider treatment preferences. They are sometimes performed with multiple primary service codes, either a combination of the five most common codes or in combination with other GIE codes. Last, they are delivered in both HOPDs and ambulatory surgery centers (ASCs), which usually have Medicare site-of-care payment differentials that pay HOPDs more (Whaley, Post and Perkins 2024), and site-of-care payment differentials are generally amplified in higher commercial insurance prices (Hao, Rathi et al. 2024, Robinson, Whaley and Dhruva 2024, Burleson, Davenport et al. 2025, Lou, Linehan et al. 2025).

1.2 Conceptual Model

I investigate price transparency's effect on all-inclusive service spending within a conceptual model of patient interaction with the healthcare system. I use an adapted version of Andersen et al.'s Behavioral Model of Health Services Use which conceptualizes how an individual responds to an illness (Andersen 1968). In the model, illness creates a "need", and whether the need is acted upon and what action is taken is mediated by "predisposing factors" that affect the individual's desire to act and by "enabling factors" that influence their ability to act. The individual's response to the need affects their health status and spending. Baker et al. proposed an adapted Andersen framework for their review of consumer-oriented strategies for improving health benefit design that simplified predisposing and enabling factors into a single category, “mediating factors”, because whether to classify factors as predisposing or enabling may be unclear (Baker, Bundorf et al. 2007). In their model, consumer-oriented strategies affect patient and provider decisions by altering the “core mechanisms” or three key mediating factors— out-of-pocket prices, the ease of access to services, and the availability of information about the price and quality of different treatments and providers. An individual’s principal responses are whether they interact with the healthcare system, which provider(s) they consult, and the service(s) they receive (Figure 1.1).

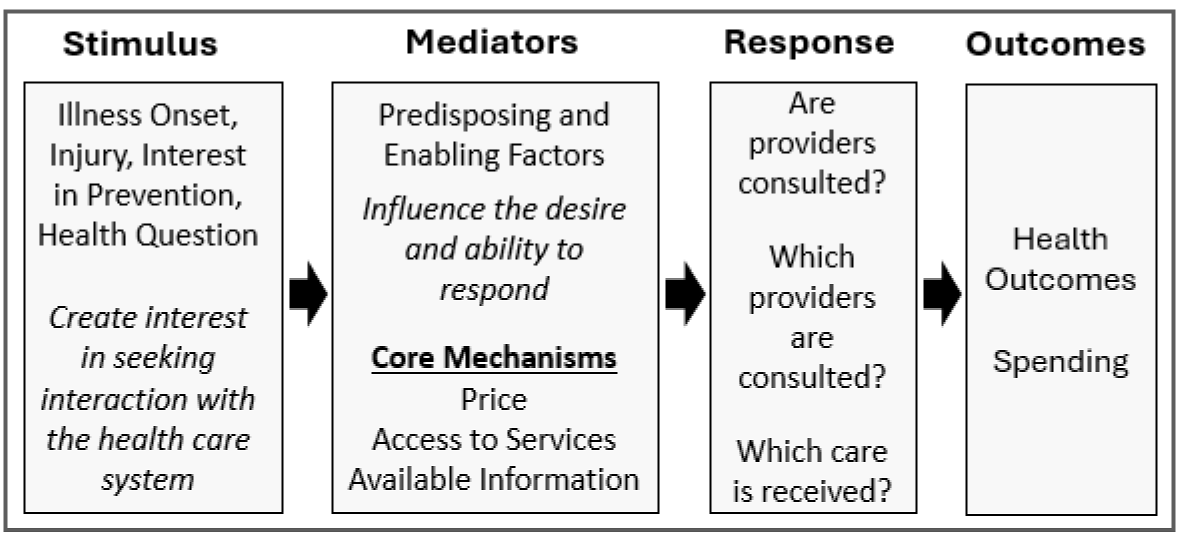

Figure 1.1 Adapted Andersen Model from Baker et al. 2007

Price transparency alters the available information core mechanism. For price transparency to be effective, individuals need a financial incentive to seek out price information (Stigler 1961, Salop and Stiglitz 1977). Traditional health insurance has cost-sharing that sometimes does not generate substantial cost-sharing differences between providers despite substantial total price differences. Cost-sharing does not meaningfully differ in many circumstances: when an individual is past their deductible and a small coinsurance rate applies or is past their out-of-pocket maximum; when a person receives a preventive service that is exempt from cost-sharing; and when a service is only subject to a uniform copay regardless of provider. Price transparency has been most effective when paired with non-traditional cost-sharing designed for specific services and when paired with targeted outreach to facilitate price shopping.

Non-traditional cost-sharing benefits have generated savings that are a larger share of potential savings than price transparency has typically achieved in populations with traditional cost-sharing. The most studied non-traditional benefits are reference pricing benefits (Robinson, Brown and Whaley 2017)— regular or reduced cost-sharing applies for the service below the reference price, and the enrollee is responsible for spending above the reference price, which usually applies even if the enrollee has exceeded their deductible or out-of-pocket maximum—and tiered provider networks (Sinaiko, Landrum and Chernew 2017, Prager 2020, Ackley 2022, Ackley 2025)—the payer assigns providers to tiers based on a value assessment of quality measures and price and more preferred tiers have lower cost-sharing. One study evaluated the effect of a population gaining a price transparency platform before starting a reference pricing benefit several months later for laboratory and diagnostic imaging tests (Whaley, Brown and Robinson 2019). The introduction of price transparency did not affect spending, but the reference pricing benefit resulted in a 27% reduction in average lab test price paid and a 13% reduction in average imaging test price paid.

A less studied, non-traditional benefit is direct financial payments used to reward shoppers for choosing lower-priced providers, which have primarily generated savings for MRIs (Whaley, Sood et al. 2021). Apart from financial incentives, initiatives that provided call center assistance to facilitate price shopping by individuals or telephoned individuals to suggest using a lower cost provider have also succeeded in stimulating price shopping and generating savings in populations with traditional cost-sharing (Wu, Sylwestrzak et al. 2014, Lieber 2017).

Baker et al noted that the effectiveness of a consumer-oriented strategy depends on its context which is important to consider to understand how the effects of a consumer-oriented strategy may vary. The effectiveness of price transparency at stimulating use of lower priced providers and price competition is highly sensitive to contextual factors. This dissertation investigates two key types of contextual factors: (1) service treatment complexity and clinical uncertainty and (2) provider referrals for shoppable services.

Service complexity and clinical uncertainty can both support and inhibit price transparency. More complex shoppable services are generally higher spending, so they can have a greater financial incentive for price shopping. However, comparing providers' all-inclusive prices is harder for services with more clinical treatment variation including both services with more variation in the codes billed in a service package and variation in how much of a service is billed by independent billing entities rather than the primary provider organization. Greater service complexity may also discourage price shopping when provider quality is hard to compare across providers. Many complex services occur infrequently, so all-inclusive prices cannot be precisely estimated.

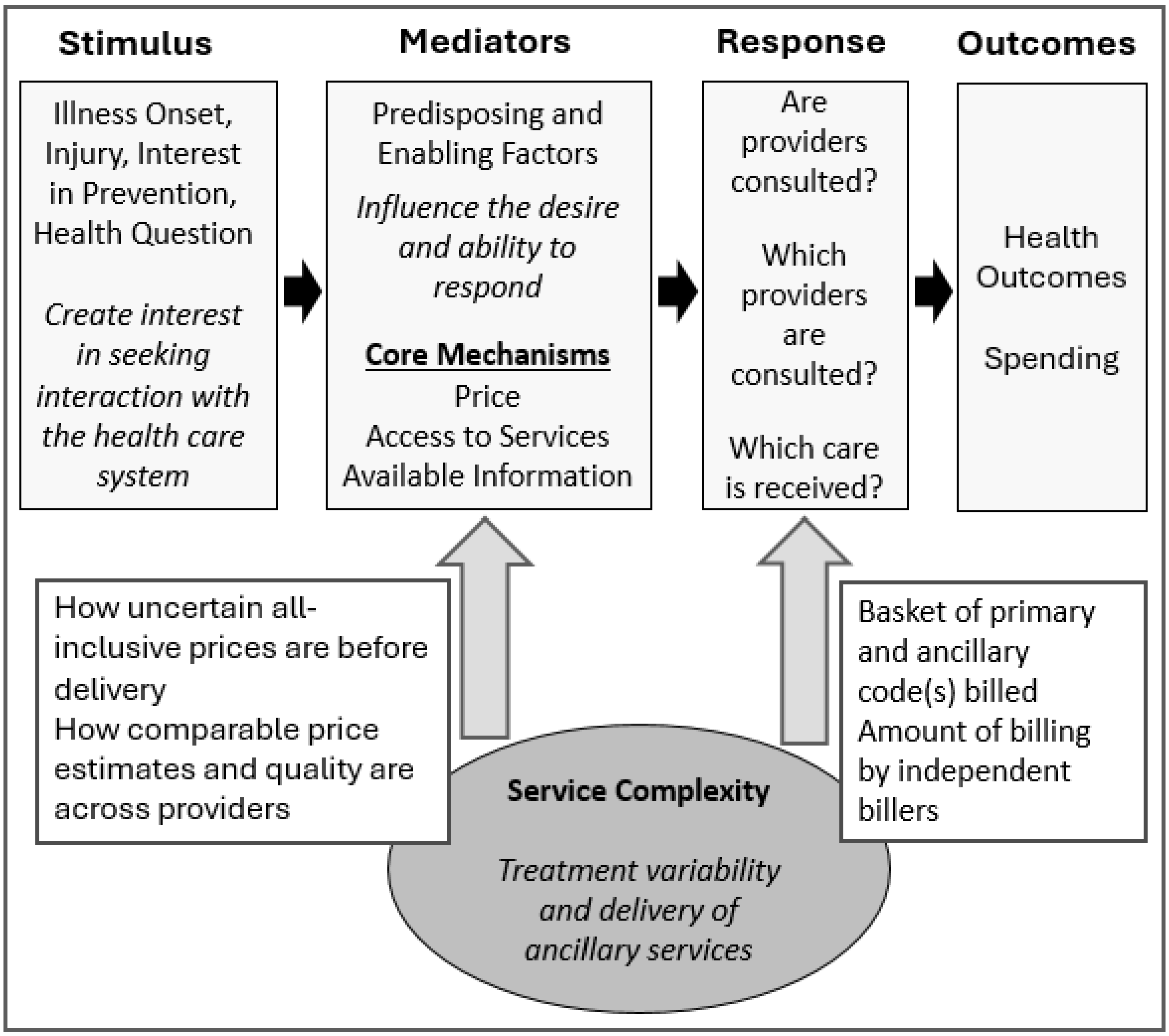

Figure 1.2 Adapted Andersen Model with Service Complexity

The influence of referring practitioners is one of the most important contextual factors that can impede price transparency (Chernew, Cooper et al. 2021). Survey research has found that Americans highly value their existing physicians' referral recommendations and are reluctant to switch to new providers. In a national survey, most respondents exclusively relied on physician referrals to choose specialists and facilities for procedures (Tu and Lauer 2008). In a survey of Massachusetts residents, a primary care physician referral would shift 30-45% of respondents from indifference to preferring a community hospital near their home versus an academic medical center for a hypothetical MRI, normal vaginal delivery, or knee replacement (Koch-Weser, Chui et al. 2019). Among the subgroup of respondents to a national survey who did not consider going to another physician before the last time they received medical care, 77% said they did not because they had gone to their provider before (Mehrotra, Dean et al. 2017).

Ideally, referring practitioners would have perfect information about all practitioners and facilities they might refer to and would refer a patient to the provider that would offer the best value for the patient considering quality, price, and convenience. In reality, practitioners generally refer to a small number of providers that they know from their personal experience (Chernew, Cooper et al. 2021, Agha, Ericson et al. 2022). Practitioners make suboptimal referrals not only because they lack perfect information about all providers, but also because of commercial incentives. When a practitioner's clinic is vertically integrated with a hospital or health system, the practitioner is more likely to refer for services to the health system's facilities (Baker, Bundorf and Kessler 2016, Carlin, Feldman and Dowd 2016, Richards, Seward and Whaley 2021). Vertical integration has significant implications for efforts to use price transparency to stimulate price shopping because the share of physicians working for hospitals or health systems has more than doubled from 26% in 2012 (Physicians Advocacy Institute 2019) to 59.7% at the beginning of 2026 (Physicians Advocacy Institute 2026). For shoppable services, health system facilities are often more expensive hospital outpatient departments in comparison to freestanding clinics and ambulatory surgery centers that are not vertically integrated with a health system (Burleson, Davenport et al. 2025, Lou, Linehan et al. 2025). Referrals between vertically integrated clinicians and HOPDs generate a substantial portion of the use of high priced providers, so those referrals have to be disrupted to increase use of lower priced providers.

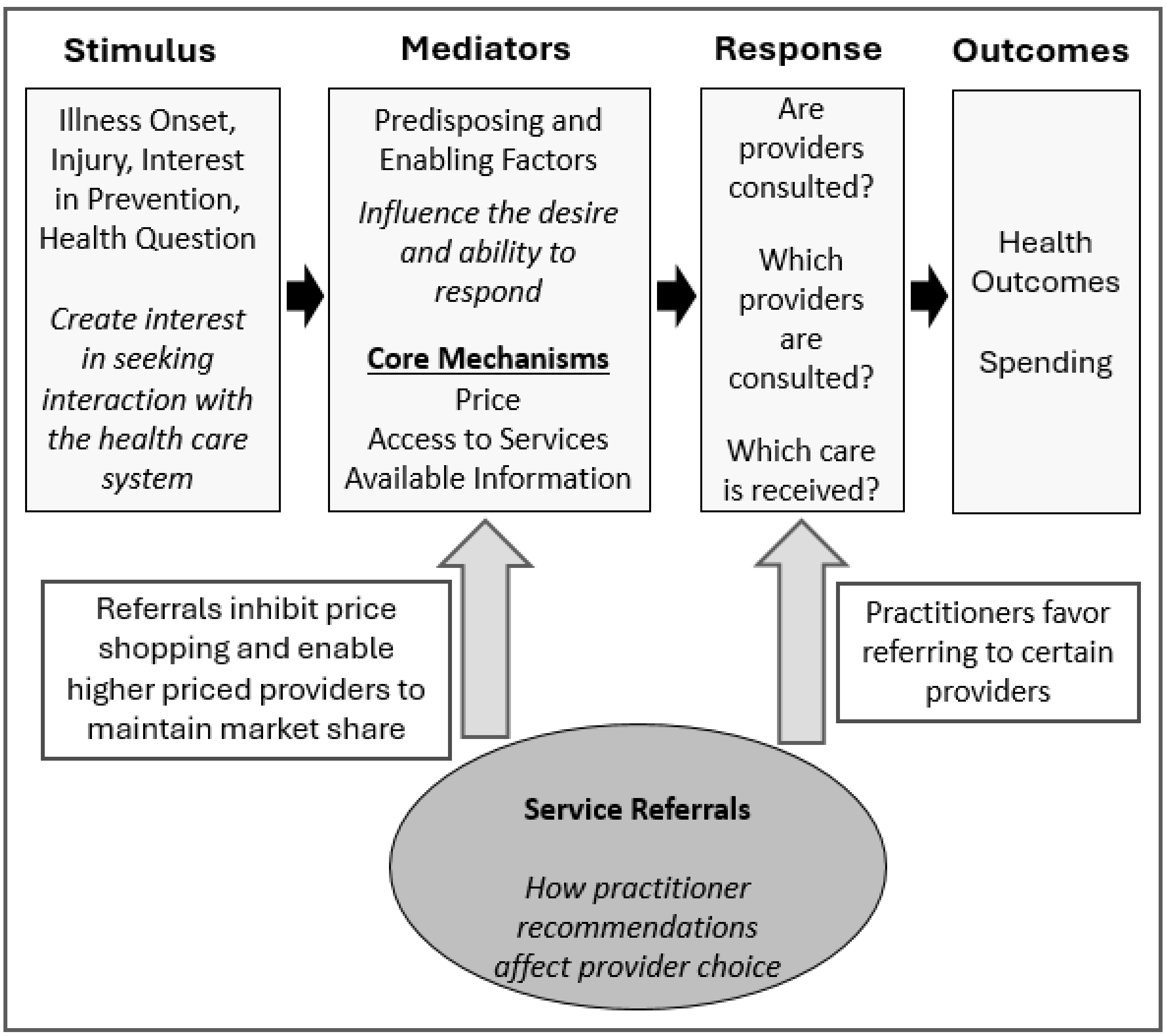

Figure 1.3 Adapted Andersen Model with Service Referrals

1.3 Objectives

This dissertation investigates how billing variation, clinical uncertainty, and treatment referrals influence all-inclusive service price transparency for GIEs and potentially other complex services. In Chapter Two, my objective was to determine how much billing variation and clinical uncertainty affect GIE service package spending. I evaluated the differences between service package spending suggested by the GIE billing code specified in a referral authorization and actual service package spending following a referral subject to clinical uncertainty. This analysis clarifies how well all-inclusive service price transparency can aid shoppers in anticipating all-inclusive GIE spending.

In Chapter Three, my objective was to determine how much ancillary services and independent billing entities affect comparisons of GIE service package spending in HOPDs and ASCs. I appraised the contributions of ancillary service spending and IBEs to GIE packages delivered in HOPDs and ASCs. This analysis shows the consequences of inconsistent reporting of ancillary services and IBE spending for comparisons for GIE HOPD and ASC facilities.

In Chapter Four, my objective was to determine the associations of vertically integrated referring and endoscopist self-referring with all-inclusive GIE service package spending and utilization characteristics. I evaluated how GIE spending and utilization characteristics varied depending on the relationship between the referring and referred practitioners of a GIE referral. This analysis helps evaluate the implications of vertically integrated referring and endoscopist self-referring for using price transparency to stimulate price shopping.

This dissertation's findings have implications for implementing all-inclusive service price transparency, it's potential effectiveness, and for the broader discourse about addressing potentially unjustified high service package prices for GIEs and other complex services.

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Chapter 2. The Implications of Treatment Variation and Clinical Uncertainty for Anticipating All-Inclusive Spending of Shoppable Gastrointestinal Endoscopies

2.1 Abstract

Introduction: A 2019 Presidential Executive Order mandated that hospitals disclose all-inclusive price estimates for "service packages" for 300 "shoppable services". I sought to determine how much billing variation and clinical uncertainty affect GIE service package spending.

Methods: I descriptively compared actual service packages delivered after a GIE code referral that had treatment and billing uncertainty to the packages that individuals would expect after a GIE referral. I used generalized linear model regressions to generate spending estimate forecasts of the later packages in the data and evaluated model performance.

Results: After a GIE referral, 67% of service packages did not have only the referred GIE code billed. Actual package spending sometimes substantially differed from estimates of packages billed as referred, particularly for the 24% of packages that had multiple GIE codes billed, which generally had at least $1000 greater package spending than packages with a single GIE code billed. The primary model forecasts of service package spending had a mean error of +/- $574. Adjusting for the GIE and ancillary codes billed in a package (i.e., controlling for the uncertainty about what would be billed) reduced the average error to +/- $299.

Conclusion: Service package prices are difficult to forecast and communicate for services with complex and uncertain billing. Regulators should explore how to best implement price transparency to improve economic decision making of patients and their clinician-agents.

2.2 Introduction

Private insurers in the United States pay widely varying prices for many health care services, which is primarily due to provider specific contracts that are sensitive to the balance of bargaining power between insurers and providers (Roberts, Chernew and McWilliams 2017, Scheffler and Arnold 2017). Previous studies have estimated that spending on many ‘shoppable’ services would fall by 30% or more if prices were no more than the median of prices paid (Brown 2018, Desai, Hatfield et al. 2019, Chernew, Cooper et al. 2021, Zhao and Berman 2023) where shoppable services are defined as those that can be scheduled in advance and are among the highest spending (White and Eguchi 2014, Frost and Newman 2016).

To enable price shopping, supporters of market-based reforms advocate for price transparency of historically confidential negotiated prices (Bloche 2006, Ginsburg 2007, Yong, Saunders et al. 2010, Steinmetz and Emanuel 2013, Reinhardt 2014). A variety of transparency initiatives proliferated during the 2010s including state and federally mandated price disclosures (Murray, Tessitore et al. 2020) and privately developed internet-based price transparency tools that provide personalized price estimates to enrollees (Desai, Hatfield et al. 2016, Desai, Hatfield et al. 2017, Whaley 2019).

Evaluations of early price transparency initiatives have found that these initiatives produced limited savings for a small number of services (Brown 2018, Whaley 2019) because the initiatives did not substantially increase low rates of price shopping (Mehrotra, Dean et al. 2017), and shoppers do not consistently choose substantially lower cost providers (Sinaiko, Joynt and Rosenthal 2016, Desai, Shambhu and Mehrotra 2021).

A 2019 Presidential Executive Order mandated nationwide price transparency for non-federally owned hospitals, beginning in 2021, and for private insurers, beginning in 2022 (Centers for Medicare and Medicaid Services 2019, Department of Health and Human Services 2019, Trump 2019, Internal Revenue Service, Employee Benefits Security Administration and Department of Health and Human Services 2020), using statutory authority from the Patient Protection and Affordable Care Act (Centers for Medicare and Medicaid Services 2019, Internal Revenue Service, Employee Benefits Security Administration and Department of Health and Human Services 2020). The hospital mandate instructs hospitals to disclose all negotiated private insurance prices as well as provide "consumer-friendly" all-inclusive price estimates of "shoppable service packages" where a package includes a service's primary billing code and any "customarily billed" ancillary codes (Centers for Medicare and Medicaid Services 2019). To comply with the hospital price transparency mandate requirements, hospitals must disclose 300 package prices that a patient can schedule in advance—70 mandatory packages with primary service codes specified by Center for Medicare and Medicaid Services (CMS) and 230 that each hospital chooses.

Increased compliance does not guarantee that the hospital mandate will be substantially more impactful. Although the hospital price transparency mandate caused hospitals to disclose more price information than had been achieved by previous initiatives, it did not lead to a degree of price transparency that significantly impacted patients' ability to price shop and thus realize lower spending. In an analysis of claims data from shortly after the hospital price transparency mandate took effect (Zhao and Berman 2023), the total possible insurer savings from price shopping in a local market were at least 30% of total spending for each of five service categories. Possible savings were reduced by at least two-thirds in each service category when savings were restricted to visits when an enrollee had a cost-sharing incentive to switch to a lower priced provider. Of the remaining potential insurer and out-of-pocket savings, most could only be realized by switching to non-hospital settings that are not federally required to disclose prices. A minimal share of potential savings were available by switching from a higher priced hospital to a lower priced hospital whose prices were disclosed because of the hospital price transparency mandate, which is consistent with hospital outpatient departments (HOPDs) generally being substantially more expensive than non-hospital settings for scheduled outpatient services (Burleson, Davenport et al. 2025, Lou, Linehan et al. 2025).

When considering how to make price transparency more effective, stakeholders should interrogate how well price estimates correspond to amounts ultimately billed. To support effective price shopping, price transparency must account for two complicating issues: (1) there is clinical uncertainty prior to delivering many services, so the expected and actual billing for a service may differ and (2) some services occur as packages, and consumers need a total cost estimate to be able to make an informed decision. To study the accuracy of service package price estimates for services that are affected by clinical uncertainty, referral authorizations for pre-approved procedures provide a valuable record of an enrollee's expected service need before service delivery. Information about the estimated cost for a referred service could help a patient understand the expected total price but will be inaccurate if the final bill includes or omits services that are not properly accounted for in the estimate.

To investigate the feasibility of generating all-inclusive spending estimates for shoppable services packages, I studied the relationship between anticipated spending suggested by referrals and actual billed amounts. Potential discrepancies are most likely for procedures with complex billing, so I chose to focus on gastrointestinal endoscopies (GIEs). GIEs are attractive to study because they have substantial cost variation across providers and care settings, which creates a greater opportunity to study anticipated and actual costs. Also, GIEs are among the most common of the 70 service packages with mandated price transparency for all hospitals and are typically performed with one or more ancillary codes for anesthesia, pathology, and/or injectable drugs – each billed with separate codes from the primary GIE service code(s). Finally, colonoscopies for colorectal cancer screening make up a large share of all GIEs and are usually exempt from cost-sharing as a preventive service (Department of Labor, Department of Health and Human Services and Department of the Treasury 2014) but can be subject to alternative health plan benefits that have cost sharing at high priced providers (Robinson, Brown et al. 2015, Aouad, Brown and Whaley 2019, Ackley 2022) or cash inducements for using low cost providers (Whaley, Sood et al. 2021), which further complicates efforts at price transparency.

2.3 Methods

Data and Setting

The study's primary data were administrative claims and referral authorizations for Kaiser Permanente Washington (KPWA) members between January 2012 and September 2019[1]. The minor limitation of using 2012-2019 data is that prices have increased since the data's time range, although, fortunately, the fundamental nature of the uncertain, complex billing of gastrointestinal endoscopies and the insurer-provider negotiations that set prices have not meaningfully changed. I included adult members aged 18-64 who did not have a Medicare Advantage plan. KPWA is a non-profit, vertically integrated health provider and insurer with approximately 600,000 insured members in Washington State and northern Idaho. The population was the 30% of enrollees for which KPWA contracts for GIE services from community providers[2]. The KPWA Regional Institutional Review Board approved this data-only research for the protection of human subjects.

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[1] Kaiser Permanente acquired Group Health Cooperative on February 1st 2017, which was renamed Kaiser Permanente Washington.

[2] Most KPWA members, ~70%, receive all or most care from KPWA facilities and practitioners mostly in the Seattle metropolitan area and adjacent western Washington areas. The 30% of KPWA members that have closer access to contracted providers for GIEs includes members residing in central and Eastern Washington counties, in northwest Idaho between Lewiston and Coeur d'Alene, and in the northwest Washington counties Skagit, Whatcom, San Juan, and Island. We excluded KPWA members in southwest Washington because KP also does business as Kaiser Permanente Northwest (KPNW) in the Portland, OR metro area including southwest Washington predating KP's acquisition of KPWA, and because most of the southwest WA population lives near and/or receives services from

GIE Referral Authorizations

I focused on the five most common GIEs within KPWA, which make up 96% of all GIE referrals and 90% of GIE claim lines. These procedures, identified with their Current Procedural Terminology (CPT) code are diagnostic examination of esophagus, stomach, and/or upper small bowel using an endoscope (CPT 43235), biopsy of the esophagus, stomach, and/or upper small bowel using an endoscope (43239), diagnostic examination of large bowel using an endoscope (45378), biopsy of large bowel using an endoscope (45380), and removal of polyps or growths of large bowel using an endoscope (45385). When a GIE referral request is authorized, KPWA sends the member a letter via post or email that includes the referred provider's contact information and the service billing code. The GIE billing code specified in the referral authorization may be the only foreknowledge a member has of the service package that the provider will bill.

Deriving Service Packages

The hospital price transparency mandate defines a service package as a shoppable service identified by common industry codes (e.g. CPT, Diagnosis-Related Group (DRG), or Healthcare Common Procedure Coding System (HCPCS)) and any ancillary service(s): "an item or service a hospital customarily provides as part of or in conjunction with a shoppable primary service" (Centers for Medicare and Medicaid Services 2019). I used two criteria for identifying medical bills to include in a GIE service package.

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either the furthest south KPWA provider facilities in Olympia, WA or the furthest north KPNW facilities in Longview and Vancouver, Washington.

The first criterion included bills with a GIE-specific billing code and other bills from any sub-provider entity[3] who billed a GIE-specific billing code[4]. In addition to the five most common GIE procedure codes, GIE-specific billing codes included GIE anesthesia (CPT codes 00731-2, 00740, 00800, 00810-3, 00902, and HCPCS code G0500) and other GIE procedures that are sometimes billed after a top five GIE referral: CPT code ranges 43180-43278 (endoscopic procedures on the esophagus), 44360-44379 (endoscopic small intestine procedures), 44380-44408 (endoscopic stomal procedures), and 45300-45399 (endoscopic procedures on the rectum) and HCPCS code ranges G0104-G0106 and G0120-G0122 (colorectal cancer screening professional services). The second criterion included bills that had a surgical pathology claim line, CPT codes 88300-88399, which independent labs commonly bill separately from bills for GIE-specific codes and, therefore, are not identified by the first criterion.

To generate package spending, I summed bills in a service package including all claims from independent billing entities (endoscopist service fee claims, anesthesia provider claims, and independent lab claims).

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[3] A parent provider organization is the highest level of the provider organization hierarchy which includes one or more sub-provider entities.

[4] For most service packages, this criteria only identified bills with a GIE related billing code to include in a package, but sub-provider entities occasionally had multiple bills that should have been included in a service package in which one or more of the bills include ancillary codes, but not GIE-related codes. In rare cases, bills had more than one billing sub-provider entity of individual claim lines, so we had to specify to include bills with a claim line billed by the sub-provider entity rather than bills by the sub-provider entity.

Population

The study population is a subset of KPWA's membership that included 46,317 members who had 70,183 referrals for the five most common GIEs. Of those referrals, 56,817 were received by 40,548 members that preceded 51,352 GIE service packages. I excluded 7,323 packages (14.3%) for one or more of eight reasons that prevented us from deriving necessary variables for the analyses or that made a needed GIE more complex than was typical or unsuitable for price shopping. 44,029 packages that met all inclusion criteria were delivered at 45 facilities operated by 36 provider organizations. Table 2.1 contains the full list of exclusions and average spending amounts for packages with each exclusion. The referrals data made two exclusions possible: 1317 packages (2.6%) that were billed with a referral code that was not related to GIEs and 1379 packages (2.7%) that were billed with a GIE referral labeled urgent/expedited or retrospective.

Statistical Analysis

I first summarized characteristics of GIE referrals and referral recipients stratified by GIE clinical entry point (upper or lower GIE entry) for the data's first and last two-year time periods. I next compared 2018-2019 GIE service package utilization and spending for two sets of service packages for each of the five most common GIE codes side-by-side. The first set were packages as they occurred after a GIE referral that sometimes had discrepancies between which GIE code was referred and billed. The second set were packages that had only one GIE code billed, which I used as an estimate of what spending would have been for the referred GIEs in the first set had they been billed as referred.

Table 2.1 GIE Package Exclusion Criteria for Chapter Two

Exclusion	**N**	**%**	**Median Package Spending, $**	**Mean Package Spending, $**
Unable to identify package's provider organization or location	2377	4.63	2099	2772
Referral in package for a billing code that was not one of the five shoppable GIEs, a GIE anesthesia code, an evaluation and management code (CPTs 99202-99499), or a three-digit UB-04 institutional provider revenue code (form locator 42)	1317	2.56	2696	3497
Urgent/expedited or retrospective referral in package	1379	2.69	2571	2876
Package delivered outside the study geographic area	932	1.81	2090	2961
Inpatient hospital bill in package	584	1.14	2626	4251
Package had a referring provider organization, referred endoscopist, or referred provider organization with fewer than five top 5 GIE referrals in the dataset	1979	3.85	2095	2643
Emergency bill in package or in the prior two weeks	1185	2.31	2014	3139
Member had a cognitive impairment, dementia, or psychosis diagnosis within 12 months before the package	84	0.16	1907	2635
All packages with one or more exclusion criteria	7323	14.26	2206	2741
All packages with zero exclusion criteria	44029	85.74	1586	1969

Finally, I reported contingency tables that summarized the frequencies and spending amounts of individual combinations of referred and billed GIE code(s).

Spending Prediction Analysis

I estimated expected spending using a generalized linear model (GLM) (Deb and Norton 2018) with gamma distribution and log link (Park 1966, Ramsey 1969, Pregibon 1980) that I adjusted for covariates encompassing information about the referral, referring and referred providers, and referral recipient that were known before service delivery. This approach used historical spending to estimate subsequent service spending and accounted for potentially relevant information known prior to service delivery to improve those estimates. The model was estimated using 36,452 service packages that were delivered between January 1, 2012, and June 30, 2018 (82.8% of packages that met all eligibility criteria). I then used the model to forecast spending for 7577 (17.2% of total) service packages from July 1, 2018, through September 30, 2019. I reran the model with different covariate and sample specifications and evaluated model performance using mean prediction error, mean absolute value of the prediction error (MAPE), the MAPEs of the first and last deciles of the spending distribution, and the MAPE for the combined middle eight deciles.

The covariate adjustments in the models included three types of information that potentially predict spending and were available before GIEs were performed: (1) referral *information that would be apparent in a price search*—the GIE referral code (the searched service), referred provider organization, and referred GIE facility; (2) referral *information* *that would not be apparent in a price search*—the GIE referring practitioner, referring provider organization, and referred endoscopist; and (3) *referral recipient information from health plan administrative records*—age, sex, county of residence, plan cost-sharing terms, and historical spending. The difference between the first and second types of referral information is consequential for the feasibility of incorporating the information in price transparency estimates: the second type requires real time referrals data access when preparing a price estimate while the first type can be incorporated in price estimates and only requires historical referrals data for periodically refitting the model. In the primary model, I adjusted the model for all covariates listed above except I omitted GIE referring practitioner, which risked overfitting the model by adding 1,812 parameters, and omitted benefits fields and historical spending, which were missing for some packages. All covariates were interacted with package year except for referred practitioner and referring provider organization. I fit additional models that analyzed the same set of packages as the primary model but changed which covariates were controlled for: a baseline naive model that was only adjusted for year fixed effects; a model that additionally controlled the primary model for the GIE referring practitioner; a model that removed covariates from the second and third sources of information included in the primary model to estimate their incremental effects; and a model that controlled for the actual GIE and ancillary services codes billed in packages, which quantified the impact of the clinical uncertainty of service package delivery and billing on package spending prediction accuracy. In the sensitivity analyses, I additionally controlled for covariates that were missing for some packages: (1) insurance benefits variables (insurance plan type (Health Maintenance Organization, Preferred Provider Organization, Point-of-Service), plan purchaser (commercial, small business, individuals and families), individual deductible, and individual out-of-pocket maximum) and (2) member's past spending in the 365 days before the package. Last, I conducted sensitivity analyses that stratified the primary analysis by individual referred GIE code and separately by GIE clinical entry—upper or lower.

2.4 Study Results

Of 44,029 GIE service packages that met eligibility criteria, 7,497 had a preceding upper GIE billing code referral(s) (17.0%); 33,497 service packages had a preceding lower GIE referral(s) (76.1%); and 3,035 had both preceding upper and lower GIE referrals (6.9%). Referral recipient demographic and benefits characteristics are reported in Table 2.2.

Comparison of Actual Spending of Packages Following a GIE code Referral vs. Estimated Spending of Packages Billed as Referred

For upper and lower diagnostic GIEs (CPT codes 43235 and 45378), mean estimated spending for each GIE code if it had been billed as referred was $959 and $800 less, respectively, in 2018-2019 than for actual packages with treatment variation and clinical uncertainty following a referral for a 43235 or 45378 code (Table 2.3). For upper and lower GIEs with a biopsy and lower GIE with polyp removal (CPTs 43239, 45380, and 45385), comparisons between packages billed as referred and actual packages had smaller mean spending differences: $204 greater package spending for packages billed as referred with a single 43239 code billed, $54 less for 45380, and $192 more for 45385. Notably, the estimates of CPT 43239 and 45385 packages billed as referred had greater mean spending

Table 2.2 Characteristics of GIE Referral Recipients

		Upper GIE referral 2012-13 N=3,444	Upper GIE referral 2018-19 N=3,371	Lower GIE referral 2012-13 N=12,958	Lower GIE referral 2018-19 N=12,485
Year	**2012**	1,669 (48.5%)		6,313 (48.7%)	
	2013	1,775 (51.5%)		6,645 (51.3%)	
	2018		2,053 (60.9%)		7,590 (60.8%)
	2019		1,318 (39.1%)		4,895 (39.2%)
Age	**median (IQR)**	52.2 (42.2-58.9)	53.1 (41.6-59.6)	55.1 (50.8-60.0)	56.4 (51.0-61.2)
Age groups	**18-35**	544 (15.8%)	562 (16.7%)	576 (4.4%)	615 (4.9%)
	36-49	926 (26.9%)	856 (25.4%)	1,596 (12.3%)	1,430 (11.5%)
	50-54	600 (17.4%)	484 (14.4%)	4,221 (32.6%)	3,291 (26.4%)
	55-59	683 (19.8%)	673 (20.0%)	3,331 (25.7%)	2,986 (23.9%)
	60-65	691 (20.1%)	796 (23.6%)	3,234 (25.0%)	4,163 (33.3%)
Female	**n (%)**	2,102 (61.0%)	2,025 (60.1%)	7,250 (55.9%)	7,027 (56.3%)
Residence in non-metro area	**n (%)**	473 (13.8%)	512 (15.3%)	2,238 (17.3%)	2,302 (18.5%)
Estimated drive time to endoscopist	**median (IQR)**	34.7 (24.9-47.0)	34.5 (22.7-47.0)	33.5 (23.1-46.0)	34.9 (24.9-46.8)
Plan type	**HMO**	2,141 (62.2%)	2,877 (85.3%)	8,018 (61.9%)	10,658 (85.4%)
	POS	1,275 (37.0%)	367 (10.9%)	4,832 (37.3%)	1,272 (10.2%)
	PPO	27 (0.8%)	127 (3.8%)	108 (0.8%)	554 (4.4%)
Plan purchaser	**Commercial**	2,957 (85.9%)	2,329 (69.1%)	10,518 (81.2%)	7,889 (63.2%)
	I&Fs	344 (10.0%)	823 (24.4%)	1,776 (13.7%)	3,618 (29.0%)
	Small Biz	142 (4.1%)	219 (6.5%)	664 (5.1%)	977 (7.8%)

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Table 2.2 Continued

		Upper GIE referral 2012-13 N=3,444	Upper GIE referral 2018-19 N=3,371	Lower GIE referral 2012-13 N=12,958	Lower GIE referral 2018-19 N=12,485
Individual Annual Deductible	**median (IQR)**	250 (0-350)	250 (150-1150)	250 (0-500)	250 (175-2000)
Individual Annual Deductible	**$0**	1,143 (33.2%)	571 (17.0%)	3,854 (29.7%)	1,762 (14.1%)
	$50-250	991 (28.8%)	1,412 (41.9%)	3,501 (27.0%)	4,640 (37.2%)
	$275-850	829 (24.1%)	453 (13.5%)	3,262 (25.2%)	1,676 (13.4%)
	$1000-2500	390 (11.3%)	451 (13.4%)	1,734 (13.4%)	1,881 (15.1%)
	$2600-7900	90 (2.6%)	479 (14.2%)	606 (4.7%)	2,503 (20.1%)
Individual Out-of-Pocket Limit	**median (IQR)**	2000 (1000-2000)	3000 (1700-5750)	2000 (1000-2000)	3000 (2000-6500)
Individual Out-of-Pocket Limit	**$0**	574 (16.7%)	187 (5.6%)	2,473 (19.1%)	658 (5.3%)
	$700-1900	979 (28.4%)	679 (20.2%)	2,997 (23.1%)	1,919 (15.4%)
	$2000-2800	1,375 (39.9%)	749 (22.3%)	5,156 (39.8%)	2,744 (22.0%)
	$3000-5000	419 (12.2%)	826 (24.5%)	1,659 (12.8%)	2,815 (22.6%)
	$5100-10000	96 (2.8%)	925 (27.5%)	672 (5.2%)	4,326 (34.7%)
Days remaining in plan year	**median (IQR)**	187 (96-278)	211 (125-287)	181.5 (88-272)	206 (125-285)
Whether referral noted in any GIE package claims	**n (%)**	2,521 (73.2%)	1,705 (50.6%)	9,998 (77.2%)	8,273 (66.3%)

Table 2.3 Comparison of GIE Service Packages that Followed a GIE Referral Code and Packages that Had a Single GIE Code Billed, 2018-2019

			GIE Code				
			43235	**43239**	**45378**	**45380**	**45385**
Packages that followed the GIE referral code, N =			**652**	**999**	**2,725**	**4,845**	**206**
Packages with only the GIE code billed*, N =			**136**	**1,095**	**1,307**	**2,116**	**1,611**
Total service package spending	**After GIE Referral**	**mean (SD[a])**	$2,750 (1,495)	$1,652 (978)	$2,418 (1,423)	$1,934 (1,136)	$1,658 (804)
	One GIE Billed		$1,791 (958)	$1,856 (917)	$1,618 (918)	$1,880 (830)	$1,850 (802)
	After GIE Referral	**median (IQR[a])**	$2,526 ($1,609-3,241)	$1,309 ($1,131-1,720)	$2,077 ($1,475-2,808)	$1,581 ($1,275-2,190)	$1,310 ($1,203-2,030)
	One GIE Billed		$1,426 ($925-2,604)	$1,442 ($1,207-2,511)	$1,151 ($993-2,123)	$1,549 ($1,378-2,078)	$1,570 ($1,375-1,831)
Package insurer payment	**After GIE Referral**	**mean (SD)**	$2,113 (1,585)	$1,233 (1,030)	$2,277 (1,393)	$1,711 (1,148)	$1,513 (786)
	One GIE Billed		$1,414 (1,027)	$1,360 (1,002)	$1,525 (925)	$1,651 (919)	$1,726 (814)
	After GIE Referral	**median (IQR)**	$1,975 ($1,061-2,861)	$1,065 ($765-1,414)	$1,885 ($1,386-2,730)	$1,475 ($1,110-2,033)	$1,308 ($1,143-1,879)
	One GIE Billed		$1,140 ($696-2,193)	$1,142 ($816-1,955)	$1,127 ($948-2,098)	$1,475 ($1,266-1,829)	$1,568 ($1,310-1,782)
Package out-of-pocket spending when >$0	**After GIE Referral**	**mean (SD)**	$667 (831)	$459 (572)	$481 (772)	$507 (672)	$473 (607)
	One GIE Billed		$441 (583)	$522 (643)	$433 (584)	$497 (635)	$444 (604)
	After GIE Referral	**median (IQR)**	$296 ($150-895)	$200 ($148-610)	$200 ($61-472)	$200 ($99-663)	$200 ($116-563)
	One GIE Billed		$200 ($150-513)	$224 ($150-722)	$200 ($112-496)	$200 ($77-663)	$200 ($52-560)
Package had bill for referred GIE code	**After GIE Referral**	**n (%)**	68 (10.4%)	832 (83.3%)	767 (28.1%)	2,451 (50.6%)	111 (53.9%)
	One GIE Billed		58 (42.6%)	661 (60.4%)	546 (41.8%)	1,385 (65.5%)	93 (5.8%)
Package had bill for 2+ GIE codes	**After GIE Referral**	**n (%)**	148 (22.7%)	177 (17.7%)	776 (28.5%)	1,347 (27.8%)	32 (15.5%)
	One GIE Billed		0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)

Table continued on next page.

Table 2.3 Continued

				GIE Code				
				43235	43239	45378	45380	45385
Packages that followed the GIE referral code, N =				**652**	**999**	**2,725**	**4,845**	**206**
Packages with only the GIE code billed*, N =				**136**	**1,095**	**1,307**	**2,116**	**1,611**
Package had deductible spending		**After GIE Referral**	**n (%)**	222 (34.0%)	307 (30.7%)	397 (14.6%)	1,102 (22.7%)	27 (13.1%)
		One GIE Billed		29 (21.3%)	370 (33.8%)	127 (9.7%)	491 (23.2%)	251 (15.6%)
Package deductible amount when >$0		**After GIE Referral**	**median (IQR)**	$986 ($309-1,778)	$874 ($250-1,257)	$262 ($118-825)	$359 ($104-1,275)	$476 ($107-1,276)
		One GIE Billed		$844 ($591-1,595)	$877 ($250-1,303)	$389 ($158-920)	$395 ($99-1,320)	$200 ($65-1,200)
Package had coinsurance spending		**After GIE Referral**	**n (%)**	275 (42.2%)	360 (36.0%)	296 (10.9%)	810 (16.7%)	23 (11.2%)
		One GIE Billed		54 (39.7%)	420 (38.4%)	107 (8.2%)	369 (17.4%)	162 (10.1%)
Package coinsurance amount when >$0		**After GIE Referral**	**median (IQR)**	$291 ($165-500)	$199 ($126-287)	$136 ($46-374)	$179 ($73-322)	$86 ($20-374)
		One GIE Billed		$182 ($149-340)	$223 ($129-339)	$136 ($75-257)	$167 ($72-298)	$142 ($26-286)
Package had copay spending		**After GIE Referral**	**n (%)**	351 (53.8%)	559 (56.0%)	309 (11.3%)	868 (17.9%)	29 (14.1%)
		One GIE Billed		71 (52.2%)	624 (57.0%)	135 (10.3%)	420 (19.8%)	148 (9.2%)
Package copay amount when >$0		**After GIE Referral**	**median (IQR)**	$100 ($30-200)	$50 ($30-200)	$75 ($30-150)	$100 ($30-150)	$150 ($150-200)
		One GIE Billed		$50 ($20-150)	$75 ($30-200)	$100 ($30-200)	$100 ($30-150)	$100 ($30-200)
Cost-sharing portion of package spending	**None**	**After GIE Referral**	**n (%)**	51 (7.8%)	92 (9.2%)	1,931 (70.9%)	2,752 (56.8%)	143 (69.4%)
		One GIE Billed		22 (16.2%)	72 (6.6%)	1,031 (78.9%)	1,147 (54.2%)	1,168 (72.5%)
	Some	**After GIE Referral**	**n (%)**	538 (82.5%)	802 (80.3%)	765 (28.1%)	1,906 (39.3%)	58 (28.2%)
		One GIE Billed		106 (77.9%)	904 (82.6%)	251 (19.2%)	869 (41.1%)	404 (25.1%)
	Full	**After GIE Referral**	**n (%)**	63 (9.7%)	105 (10.5%)	29 (1.1%)	187 (3.9%)	5 (2.4%)
		One GIE Billed		8 (5.9%)	119 (10.9%)	25 (1.9%)	100 (4.7%)	39 (2.4%)

* I used packages with a single GIE code billed to estimate what spending would have been for referrals of the same GIE code had they been billed as referred

than actual packages after a 43239 or 45385 referral even though the latter sometimes included bills for multiple GIE codes. Providers billed multiple GIE codes in 16.9% to 26.8% of packages after a referral for one of the five most common GIE codes.

Comparison of Referred and Billed GIE Codes

For all packages from 2012-2019 with only one preceding GIE referral code, only 32.6% had a claim line(s) for the referred GIE and no other GIE code (Table 2.4). Among those packages, the subset from 2018-2019 had $1725 mean package spending. From 2012-2019, the frequency that a package had a claim line(s) for only the referred GIE varied from 13.4% for packages following a 43235 referral to 68.1% for packages following a 43239 referral. Most billing of GIEs that wasn't the referred GIE was for another code with the same upper or lower clinical point of entry as the referred GIE. From 2012-2019, 15.5% of packages had multiple GIE codes billed that included the referred GIE and 9.2% had multiple GIE codes billed that did not include the referred GIE. Compared to packages with only one GIE code billed, packages from 2018-2019 with multiple GIE codes billed that included the referred GIE had almost $1000 greater mean spending, and packages that had multiple GIE codes billed that did not include the referred GIE had $1800 greater mean spending. Following referrals for a 43235, 45378, or 45380 code, the plurality of packages had claim(s) for one GIE code that was not the referred GIE and the majority of packages did not have the referred GIE billed by itself or with other GIE code(s).

Table 2.4 GIE Package Frequencies and Average Spending for Combinations of GIE referral code and billed GIE code(s)

GIE code(s) Billed in Package	Top 5 GIE Referral Code Received Before Package: 43235	43239	45378	45380	45385	Total
	Package Frequencies 2012-2019					
Only referred GIE code	404 (13.4%)	2991 (68.1%)	2661 (29.4%)	6774 (29.3%)	284 (48.4%)	13114 (32.6%)
Only one non-referred GIE code	2102 (69.7%)	644 (14.7%)	4072 (45%)	10145 (43.9%)	195 (33.2%)	17158 (42.7%)
Referred GIE code and other(s)	48 (1.6%)	731 (16.7%)	683 (7.5%)	4677 (20.2%)	78 (13.3%)	6217 (15.5%)
Two+ non-referred GIE codes	462 (15.3%)	24 (0.5%)	1631 (18%)	1536 (6.6%)	30 (5.1%)	3683 (9.2%)
Total	3016	4390	9047	23132	587	40172
	Package Frequencies and Average Spending 2018-2019					
Only referred GIE code, n	58	661	546	1385	93	**2743**
mean $	2143	1585	1836	1743	1532	1725
median $	2325	1286	1718	1503	1308	1475
Only one non-referred GIE code, n	446	161	1403	2113	81	**4204**
mean $	2364	1439	2037	1526	1521	1782
median $	2407	1208	1685	1341	1149	1528
Referred GIE code and other(s), n	10	171	221	1066	18	**1486**
mean $	3932	2063	3038	2716	2330	2693
median $	4012	1555	2581	2190	1984	2235
Two+ non-referred GIE codes, n	138	6	555	281	14	**994**
mean $	4171	3080	3708	2974	2430	3543
median $	4348	2643	3103	2518	2362	2770
Total, N	**652**	**999**	**2725**	**4845**	**206**	**9427**
mean $	2750	1652	2418	1934	1658	2094
median $	2526	1309	2077	1581	1310	1647

GIE Service Package Spending Prediction Accuracy

Prediction errors for the GLM model estimates were substantial (Table 2.5). The naive model that was only adjusted for year fixed effects had a $928 MAPE. The primary model controlling for covariates from all information sources known before service delivery had 2403 parameters, mostly from referring and referred parent provider organization-year fixed effects and referred practitioner-year fixed effects. The primary model had a $574 MAPE, 38% less than the naive model. For the first, middle, and tenth deciles of spending, the model had MAPEs of $437 (mostly overestimates), $431, and $1849 (mostly underestimates), respectively.

The implication of the complete distribution of the errors for patients would be that predicted GIE service package spending would have underestimated actual spending by more than $250 for 31% of packages, more than $500 for 20% of packages, and more than $1000 for 10% of packages. Substantial underestimates occurred because the model has no variables that strongly predict when packages are more complex with multiple GIE codes billed, which can double or further increase spending compared to packages with only a single GIE code billed. Predicted GIE service package spending would have overestimated actual spending by more than $250 for 31% of packages, more than $500 for 18% of packages, and more than $1000 for 6% of packages.

In a simpler model adjusted for only information that would be apparent in a price search on its own (the GIE referral code, referred parent provider organization, and referred GIE facility), the MAPE was $10 less compared to the primary model that also adjusted for covariates from referrals information that would not have been apparent in a price search

Table 2.5 Performance of Service Package Spending Forecasting Models

Model	# of modeled service packages, 2012-2018Q2	# of model parameters	# of forecasted service packages, 2018Q3-2019	Net average prediction skew ($)	Mean absolute prediction error ($)			
					Full forecasted sample	0-10th percentile of package spending	>10th-90th percentile	>90th percentile
Main Specifications (M0-5)								
0. Year fixed effects only	34984	8	7428	339	928	975	583	3648
1. Information known before service delivery* excluding referring practitioner fixed effects	34984	2403	7428	81	574	437	431	1849
1.b. Information known before service delivery including referring practitioner fixed effects	34955	4215	7428	-121	793	763	585	2486
2. M1 excluding referring provider organization**	34984	2032	7428	82	564	447	419	1849
3. M2 minus member demographics	34984	1808	7428	85	564	443	417	1863
4. M1 plus billed GIE code fixed effects	34984	2507	7428	69	346	157	274	1112
5. M4 plus billed ancillary code fixed effects	34984	2573	7428	29	299	151	232	983

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Table 2.5 Continued

Model	# of modeled service packages, 2012-2018Q2	# of model parameters	# of forecasted service packages, 2018Q3-2019	Net average prediction skew ($)	Mean absolute prediction error ($) Full forecasted sample	0-10th percentile of package spending	>10th-90th percentile	>90th percentile
Sensitivity Analyses 1-5								
1. M1 + benefits fields	34220	2467	7206	81	575	439	432	1847
1.b. M1 + categorical benefits fields	34220	2477	7206	83	574	438	432	1849
2. M1 + prior 365 days spending	29372	2074	7423	80	577	435	437	1842
3. M1 stratified by GIE referral code: 43235	2469	1945	442	26	938	379	795	2655
3. M1 stratified by GIE referral code: 43239	3601	1811	735	101	404	265	303	1354
3. M1 stratified by GIE referral code: 45378	6799	1944	2057	23	769	530	603	2348
3. M1 stratified by GIE referral code: 45380	18893	2153	3329	46	504	430	403	1386

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Table 2.5 Continued

Model	**# of modeled service packages, 2012-2018Q2**	**# of model parameters**	**# of forecasted service packages, 2018Q3-2019**	**Net average prediction skew ($)**	**Mean absolute prediction error ($)**			
					Full forecasted sample	**0-10th percentile of package spending**	**>10th-90th percentile**	**>90th percentile**
4. M1 stratified by GIE clinical entry: Upper GIEs	6133	2167	1196	65	563	349	400	2091
4. M1 stratified by GIE clinical entry: Lower GIEs	26488	2348	5700	97	566	458	421	1835
5. M1 stratified by # of unique GIE codes billed in package: One	25328	2367	5196	30	297	370	241	683
5. M1 stratified by # of unique GIE codes billed in package: Two or more	9656	2207	2232	74	758	373	651	1998
5. M1 stratified by # of unique GIE codes billed in package: Two	8317	2203	1877	83	659	338	565	1757

*. Information known before service delivery includes most covariates derived from the data that are populated for all or nearly all packages. I list all covariates in the Spending Prediction Analysis portion of the Methods section. The impact of benefits fields and prior 365 day spending, which were not available for all packages, were evaluated as additions to the primary model in sensitivity analyses. ** M1 abbreviates Model 1, M2 abbreviates Model 2, etc.

and adjusted for member characteristics obtained from health plan administrative records (Table 2.5). The uncertainty of which GIE code(s) and ancillary services would be billed had a substantial effect on prediction accuracy. Adding fixed effects for the billed GIE code(s) improved the overall MAPE to $346. Adding fixed effects for both the GIE billing code(s) and customarily provided ancillary codes improved the overall MAPE to $299, the smallest MAPE of any model.

2.5 Discussion

For a person with a referral for a specific GIE procedure code, the expected all-inclusive service package spending accounting for clinical uncertainty can be substantially different than the expected spending assuming the procedure will be billed as referred. More than three out of five packages had predicted spending estimates that underestimated or overestimated actual spending by at least $250. When patients have substantial cost-sharing for a GIE, underestimated spending predictions cause higher out-of-pocket costs than expected. Overestimated spending predictions may discourage patients from obtaining needed care.

The referred GIE service code(s), GIE facility, and provider organization that operates the GIE facility were the strongest spending predictors that were known before service delivery. Adjusting for other information from referrals and from health plan administrative records did not improve package spending predictions. To account for the referral code when fitting a regression model for generating price transparency estimates, referrals data is needed unless a payer's or provider's claims data includes the referral code.

Even if hospital service package price estimates could perfectly forecast spending, estimates from hospitals would still have limited value to price shoppers because hospitals usually do not have real-time benefits information needed to estimate cost-sharing. A similar transparency mandate began for health plans in 2022 that requires plans provide enrollees real-time cost-sharing information for all items and services and for all contracted providers since January 1, 2024 (Internal Revenue Service, Employee Benefits Security Administration and Department of Health and Human Services 2020). When an enrollee has some, but not full cost-sharing responsibility, health plan cost-sharing disclosures would generally help enrollees price shop more than hospitals' total spending estimates.

To improve service package price transparency for complex services with uncertain billing, CMS should consider revising its guidance to hospitals for preparing service package price estimates. The uncertain spending of shoppable services after referrals might be better conveyed to shoppers by having providers report a price estimate range rather than a single price or by reporting price estimates for a standardized service package or for multiple package scenarios of varying complexity, which would facilitate making apples-to-apples provider comparisons. CMS received feedback making approximately that suggestion during the comment period for the hospital price transparency mandate but decided the agency should not dictate which ancillary codes hospitals would include in packages (Centers for Medicare and Medicaid Services 2019).

Among the 70 services that CMS mandates every hospital include in their service package price estimate disclosures, GIEs were much more common in the data than other complex services that have varied ancillary services billing. While four of the five most common GIEs had 7,000-38,000 referrals each during 2012-2019, the next most common complex services (cataract removal, sleep study, and removal of knee cartilage using endoscope) had approximately 3000 referrals each over the almost nine years of the data. Using historical claims to estimate package spending may not be possible for less common complex services except for providers and payers with large service volumes or may only be possible by using simpler prediction models with fewer parameters. Many complex services have higher average spending than GIEs, so there is potential for greater prediction errors (Horný, Shafer and Dusetzina 2021).

Limitations

The data and study design are subject to limitations. First, I studied GIE referrals and service packages of one health plan in one region, so the findings may not generalize to other care settings and clinical services. However, billing uncertainty is universal to all GIEs because the services delivered always depend on endoscopic findings during the procedure. These analyses may be difficult to scale to a national or larger geographic area because of labor intensive data processing and knowledge of providers needed to attribute packages with multiple billers to a practice location and primary provider organization.

Second, I did not have patient-specific health status or information about the reason for a GIE referral (e.g., screening vs. diagnostic GIE), which might improve service package spending forecasts. The limited patient information I had—member age, sex, and county of residence—did not affect the model's prediction performance. The model that stratified by the number of GIE codes billed in a package shows that covariates that predict delivery of more complex service packages could substantially improve service package spending prediction. Those variables would probably have to come from a complete source of a patient's medical records, which a price transparency program for a hospital or health plan would be unlikely to have.

2.6 Conclusion

All-inclusive service package price transparency has an intuitive appeal; however, these findings suggest that service package prices are difficult to foresee and communicate due to their complexity and uncertainty. Regulators should explore revising service package price transparency requirements to best support economic decision making by patients and their clinician-agents.

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Chapter 3. The Implications of Ancillary Spending and Independent Billers for All-Inclusive Gastrointestinal Endoscopy Price Estimates

3.1 Abstract

Introduction: Although the federal hospital price transparency rule's service package prices are meant to be all-inclusive, the rule grants hospitals discretion to choose ancillary services to include and does not require hospitals disclose separate spending by independent billing entities (IBEs). Incomplete hospital outpatient department (HOPD) prices may affect comparisons with ambulatory surgery centers (ASCs), which are not required to disclose prices. I described GIE service package billing in detail for packages delivered in HOPDs and ASCs to better understand how ancillary and IBE spending affects price comparisons.

Methods: I summarized GIE service package utilization and spending from ancillary services and IBE claims in GIE packages in HOPDs and ASCs. I compared GIE service package total spending and spending after omitting ancillary and IBE contributions over time in HOPDs and ASCs looking at both raw spending and covariate adjusted spending.

Results: From 2012-2019, average adjusted HOPD spending increased $1,115 to $3,410 due to higher GIE code spending while average ASC spending increased $108 to $1,444. Ancillary services and IBE spending was a small portion of total spending, changed modestly over time, and was not sufficiently large that omitting them would have made HOPDs appear price competitive with ASCs.

Conclusion: Greater GIE price shopping savings are probably achievable from increasing use of ASCs for low risk GIEs than from making hospital prices more complete.

3.2 Introduction

Transparency mandates for the privately negotiated prices of healthcare services are intended to constrain spending growth by enabling patients to comparison shop and thereby stimulate price competition (Austin and Gravelle 2008, Emanuel, Tanden et al. 2012). For the most basic billing encounter when one provider bills a service using a single billing code, price transparency is simply accomplished by disclosing all negotiated billing code prices (Felt-Lisk, Ballou and Lake 2020). For more complex services, price transparency can be more sophisticated to account for services being delivered with ancillary service(s) that may be billed by the principal service provider or separately by IBEs which can be individual clinicians with independent billing authority, medical groups, pharmacies, or laboratories (Horný, Shafer and Dusetzina 2021, Mukherjee and Horný 2023).

When price shopping for complex services, all-inclusive service price estimates can help shoppers understand the total cost of care and if total costs vary differently than the price of the primary service code. However, generating those estimates and making them comparable across providers is complicated because the exact set of codes included on a bill for a complex service depends on both case acuity and the specific treatment the provider chooses during the course of care, which can be uncertain until the treatment is in progress. Idiosyncratic billing practices can also generate differences in charges between providers even when the treatments delivered are the same (Burks, Shields et al. 2022).

A 2019 Presidential Executive Order established a price transparency mandate including all-inclusive service price transparency for non-federally owned hospitals beginning in 2021 (Centers for Medicare and Medicaid Services 2019, Department of Health and Human Services 2019, Trump 2019) using statutory authority from the Patient Protection and Affordable Care Act of 2010 (Centers for Medicare and Medicaid Services 2019, Internal Revenue Service, Employee Benefits Security Administration and Department of Health and Human Services 2020). The mandate instructs hospitals to disclose all negotiated private insurance prices and publish “consumer-friendly” all-inclusive price estimates of “shoppable service packages,” where a package contains a service’s primary billing code and any “customarily” billed ancillary codes (Centers for Medicare and Medicaid Services 2019). Price estimates are reported inconsistently across hospitals because CMS explicitly declined to specify how hospitals should determine which ancillaries are customarily provided with a shoppable primary service (Centers for Medicare and Medicaid Services 2019). Also, the statutory authority for hospital transparency does not extend to IBEs, so hospitals do not have to include the bills that IBEs contribute to service packages, which causes underestimates of total service expenses and distort comparisons with ASCs that are not subject to the hospital mandate.

To better understand how billing for complex services impacts efforts to improve price transparency, I investigate billing for nonemergency gastrointestinal endoscopies (GIEs) in hospital outpatient departments (HOPDs) and ASCs. I study GIEs because they are among the most frequently referred and billed of the 70 CMS-mandated service packages and exhibit substantial spending variation. GIE services often involve bills submitted by multiple providers as they commonly include anesthesia (anesthesia assistance administered by an independent practitioner or anesthesia administered by the endoscopist), surgical pathology, and/or injectable drugs, which are billed with separate codes from the primary GIE service and are sometimes billed by IBEs. Although colonoscopies for colorectal cancer screening make up a large share of all GIEs and are usually exempt from cost-sharing as a preventive service, price transparency is still relevant because preventive services can be subject to alternative health plan benefits that incentivize using lower priced providers (Robinson, Brown et al. 2015, Aouad, Brown and Whaley 2019, Whaley, Sood et al. 2021, Ackley 2022).

3.3 Methods

This chapter's analyses also evaluated the KPWA GIE referrals and service package data from 2012-2019 described in Section 2.3.

Population

This chapter's analyses used similar service package inclusion criteria as Chapter Two. For this chapter's analyses, I also excluded 4572 packages that had more than one preceding GIE referral code, which I added to make the packages delivered at HOPDs and ASCs more comparable. This chapter did not use the Chapter Two exclusion of packages that had a referring provider organization, referred endoscopist, or referred provider organization with fewer than five top 5 GIE referrals in the dataset. From January 2012 through September 2019, I identified 41,426 GIE packages for services provided to 34,556 members that met all study inclusion criteria that were delivered at 45 facilities operated by 36 provider organizations. I excluded 9,926 packages (19.3%) that did not meet inclusion criteria. The full list of exclusions, the frequencies of each exclusion for HOPDs and ASCs, and average spending for packages with each exclusion are described in Table 3.1 and Table 3.2.

Table 3.1 GIE Package Exclusion Criteria for All GIE Service Packages Analyzed in Chapter Three

	All Exclusions			
Exclusion	**n**	**%**	**Median Package Spending**	**Mean Package Spending**
More than one GIE referral code preceded package	4572	8.9	2443	2833
Unable to identify package's provider organization or location	2377	4.63	2099	2772
Referral in package for a billing code that was not one of the five shoppable GIEs, a GIE anesthesia code, an evaluation and management code (CPTs 99202-99499), or a three-digit UB-04 institutional provider revenue code (form locator 42)	1317	2.56	2571	2876
Urgent/expedited or retrospective referral in package	1379	2.69	2696	3497
Package delivered outside the study geographic area	932	1.81	2090	2961
Inpatient hospital bill in package	584	1.14	2626	4251
Emergency bill in package or in the prior two weeks	1185	2.31	2014	3139
Member had a cognitive impairment, dementia, or psychosis diagnosis within 12 months before the package	84	0.16	1907	2635
All packages with one or more exclusion criteria	9926	19.33	2323	2808
All packages with zero exclusion criteria	41426	80.67	1556	1905

Table 3.2 Exclusion Criteria and Average Spending by Exclusion Criteria for GIE Service Packages Delivered in HOPDs and ASCs

	HOPD package exclusions				**ASC package exclusions**			
Exclusion	**# of HOPD packages**	**% of HOPD packages**	**Median Package Spending**	**Mean Package Spending**	**# of ASC packages**	**% of ASC packages**	**Median Package Spending**	**Mean Package Spending**
More than one GIE referral code preceded package	2025	10.73	3594	3838	2304	7.65	1752	1891
Unable to identify package's provider organization or location*								
Referral in package for a billing code that was not one of the five shoppable GIEs, a GIE anesthesia code, an evaluation and management code (CPTs 99202-99499), or a three-digit UB-04 institutional provider revenue code (form locator 42)	851	4.51	2916	3450	363	1.21	1390	1541
Urgent/expedited or retrospective referral in package	790	4.19	3319	4077	394	1.31	1346	1525
Package delivered outside the study geographic area*								
Inpatient hospital bill in package	418	2.21	2636	3910	30	0.1	1453	1574
Emergency bill in package or in the prior two weeks	570	3.02	2963	3896	472	1.57	1310	1424
Member had a cognitive impairment, dementia, or psychosis diagnosis within 12 months before the package	36	0.19	3015	3878	43	0.14	1360	1490
All packages with one or more exclusion criteria	4139	21.93	3170	3701	3410	11.33	1529	1749
All packages with zero exclusion criteria	14735	78.07	2536	2788	26691	88.67	1315	1417

*Packages without a confirmed location or primary provider location do not have package setting defined, so HOPD or ASC spending values could not be calculated.

Statistical Analysis

I first summarized utilization and spending from ancillary services and IBE claims in GIE packages, stratified by delivery setting (HOPD or ASC) and period (2012–2013 or 2018–2019). Second, I summarized how frequently professional and facility claims occurred for each of the most common ancillary service billing codes in GIE packages and reported the median price and standard deviation, stratified across three dimensions: delivery setting, period, and biller role (GIE provider or IBE). Due to changes in codes used over time, some codes were only in the data during 2012–2013 or 2018–2019.

I used a generalized estimating equations (GEE) regression to estimate yearly covariate-adjusted average service package spending in HOPDs and ASCs (Liang and Zeger 1986). To examine potential differences in package spending due to ancillaries or IBEs, I repeated the regression for package spending omitting IBE and ancillary spending.

The primary explanatory variables were an indicator for whether a GIE was delivered in a HOPD versus an ASC, interacted with year fixed effects. The regression also adjusted for year fixed effects, referred GIE billing code fixed effects, and patient-level covariates (age at the time of the GIE, sex, and member residence county fixed effects). The GEE model clustered on the referring provider organization, used cluster robust standard errors (Colin Cameron and Miller 2015), and specified a log link function and gamma family distribution (Mihaylova, Briggs et al. 2011, Deb and Norton 2018). The regressions included 39,777 service packages after omitting 1,645 observations that were missing a referring provider organization and two observations that were missing a member residence county.

The analysis above did not include referring or referred clinician or provider-organization fixed effects that were controlled for in Chapter Two's analyses because individual clinicians and provider organizations contribute to the differences between HOPDs and ASCs captured by the primary explanatory variables. The regression adjusted for the referred GIE billing code but not the billed GIE code(s) because whether a member chooses a HOPD or an ASC may influence the GIE code(s) subsequently billed.

To assess how much adjusted spending estimates varied between HOPDs and ASCs when packages had a single code billed or had multiple codes billed, I also conducted a sensitivity analysis that estimated the regression stratified by whether a package had one or more than one unique GIE code billed.

3.4 Results

Sample characteristics and settings

Among packages that met eligibility criteria, 18.5% followed a referral for an upper GIE code and 81.5% followed a lower GIE referral. Overall, 34.7% of packages were delivered in HOPDs (14,735) and 65.3% in ASCs (26,691). The share of packages delivered in HOPDs increased from 29.9% in 2012 to 36.5% in 2019.

Unadjusted spending by setting and time

In 2012–2013, mean total spending per GIE service package was $2,334 in HOPDs and $1,377 in ASCs (Table 3.3). By 2018–2019, mean spending had increased $924 to $3,258 in HOPDs and had increased $112 to $1,489 in ASCs. Mean spending on GIE billing codes per package rose $879 in HOPDs (from $1,899 to $2,778) and $152 in ASCs (from

$1,121 to $1,273), while non-GIE code spending per package increased $45 in HOPDs (from $435 to $480) and decreased $40 in ASCs (from $256 to $216).

Ancillary services and IBE spending

Changes in non-GIE code spending included changes for customary ancillary services (anesthesia, surgical pathology, and injectable drugs) (Table 3.4 and Table 3.5) and changes for other less frequent ancillary or extraneous codes. Spending changes for the component parts of non-GIE code spending were also modest. GIEs delivered in HOPDs had small per capita spending increases for anesthesia ($23), surgical pathology ($16), and injectable drugs ($25) (which are billed in HOPD facility fees and never at ASCs) and a small decrease in spending on non-customary ancillary codes ($20), mostly general facility fee codes. For GIEs delivered in ASCs, spending changes were <$10 per category except for a $41 decrease in surgical pathology per capita spending.

Among packages with any IBE billing, mean IBE spending decreased $70 in HOPDs (from $433 to $363) and $108 in ASCs (from $312 to $204) between 2012–2013 and 2018–2019 (Table 3.3). The share of packages with any IBE billing declined slightly for HOPDs (72.5% to 71.6%) and increased for ASCs (73.2% to 77.1), so mean IBE spending per package fell in both settings.

Table 3.3 Characteristics of Gastrointestinal Endoscopy Service Packages in Hospital Outpatient Departments and Ambulatory Surgery Centers in 2012-2013 and 2018-2019

		HOPD 2012-13	HOPD 2018-19	ASC 2012-13	ASC 2018-19
		N=3,469	**N=3,447**	**N=7,327**	**N=6,508**
Total service package spending	mean (SD)	2334 (1043)	3258 (1488)	1377 (461)	1489 (460)
	median (IQR)	2122 (1686-2686)	2821 (2320-3762)	1262 (1059-1557)	1421 (1158-1685)
# of GIE professional claim lines in package	mean (SD)	1.4 (0.8)	1.4 (1.0)	2.4 (1.0)	2.5 (1.0)
# of GIE facility claim lines in package	mean (SD)	1.2 (0.7)	1.3 (0.8)	0.0 (0.0)	0.0 (0.0)
Endoscopy billing code package spending	mean (SD)	1899 (784)	2778 (1281)	1121 (295)	1273 (346)
	median (IQR)	1795 (1312-2162)	2443 (2003-3187)	1052 (947-1234)	1199 (1021-1436)
Non-endoscopy billing code package spending	mean (SD)	435 (535)	480 (519)	256 (290)	216 (220)
	median (IQR)	260 (101-605)	333 (164-663)	173 (0-350)	153 (76-288)
Package had out-of-pocket payment(s)	n (%)	2,241 (64.6%)	1,709 (49.6%)	5,006 (68.3%)	3,005 (46.2%)
Out-of-pocket amount when >$0	mean (SD)	307 (442)	664 (928)	305 (391)	451 (531)
	median (IQR)	188 (56-350)	245 (131-765)	190 (68-336)	200 (100-603)
% of package spending that was out-of-pocket when >0%	median (IQR)	7.7 (2.6-18.0)	9.1 (3.4-21.6)	13.2 (4.4-22.7)	15.4 (6.1-35.3)

Table continued on next page.

Table 3.3 continued

		HOPD 2012-13	HOPD 2018-19	ASC 2012-13	ASC 2018-19
		N=3,469	N=3,447	N=7,327	N=6,508
Package had customarily provided ancillary service(s)	n (%)	2,828 (81.5%)	3,258 (94.5%)	5,297 (72.3%)	5,885 (90.4%)
Number of unique customary ancillary service codes in package when >0	median (IQR)	2 (1-2)	2 (2-3)	1 (1-2)	2 (1-2)
Customary ancillary service(s) amount when >$0	mean (SD)	386 (360)	399 (364)	350 (275)	233 (202)
	median (IQR)	261 (127-573)	291 (141-564)	294 (173-460)	156 (106-305)
Customary ancillary service(s) % of spending when >0%	median (IQR)	12.6 (6.4-21.2)	9.7 (5.0-17.0)	18.5 (12.2-30.0)	11.2 (7.7-19.8)
Package had customary ancillary service(s) out-of-pocket amount	n (%)	851 (24.5%)	1,016 (29.5%)	1,748 (23.9%)	1,897 (29.1%)
Out-of-pocket amount for customary ancillary services when >$0	mean (SD)	141 (181)	187 (224)	146 (155)	134 (153)
	median (IQR)	90 (33-176)	109 (42-235)	96 (41-174)	76 (31-194)
Customary ancillary service(s) % of out-of-pocket spending when >0%	median (IQR)	27.8 (12.5-62.5)	20.2 (8.1-60.5)	27.0 (14.0-52.6)	23.4 (11.1-100.0)
Package had anesthesia billed by endoscopist (first billed 1/1/2017)	n (%)	-	1,503 (43.6%)	-	3,592 (55.2%)
Package had anesthesia assistance billed by non-endoscopist	n (%)	730 (21.0%)	718 (20.8%)	986 (13.5%)	885 (13.6%)

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Table 3.3 continued

		HOPD 2012-13	HOPD 2018-19	ASC 2012-13	ASC 2018-19
		N=3,469	N=3,447	N=7,327	N=6,508
Package had independent billing entity spending	n (%)	2,528 (72.9%)	2,488 (72.2%)	5,380 (73.4%)	5,023 (77.2%)
IBE amount when >$0	mean (SD)	435 (422)	362 (365)	312 (378)	204 (277)
	median (IQR)	256 (109-652)	228 (114-502)	164 (68-418)	104 (57-199)
IBE % of spending when >0%	median (IQR)	10.5 (5.1-25.0)	6.7 (3.5-13.9)	11.7 (5.1-28.7)	6.9 (4.6-12.6)
Package had IBE out-of-pocket spending	n (%)	1,061 (30.6%)	759 (22.0%)	1,845 (25.2%)	1,514 (23.3%)
IBE out-of-pocket amount when >$0	mean (SD)	150 (163)	182 (235)	120 (160)	120 (164)
	median (IQR)	101 (38-200)	104 (40-214)	65 (30-150)	57 (22-153)
IBE % of out-of-pocket spending when >0%	median (IQR)	63.0 (15.3-100.0)	16.7 (5.9-64.4)	25.6 (7.8-67.7)	13.5 (6.4-43.3)
Package had ancillary service and/or independent billing entity spending	n (%)	2,967 (85.5%)	3,316 (96.2%)	5,483 (74.8%)	5,943 (91.3%)
Ancillary service(s) and/or IBE amount when >$0	mean (SD)	591 (583)	505 (491)	407 (367)	269 (276)
	median (IQR)	395 (160-875)	344 (185-676)	314 (173-518)	188 (108-351)
Ancillary service and/or IBE % of spending when >0%	median (IQR)	16.0 (7.8-34.8)	12.2 (6.5-20.4)	20.7 (12.3-33.4)	11.7 (7.9-21.1)
Package had ancillary service and/or IBE out-of-pocket spending	n (%)	1,186 (34.2%)	1,055 (30.6%)	1,961 (26.8%)	1,939 (29.8%)
Ancillary service(s) and/or IBE out-of-pocket amount when >$0	mean (SD)	181 (208)	218 (272)	157 (173)	144 (173)
	median (IQR)	127 (50-222)	129 (52-262)	104 (41-198)	80 (31-200)
Ancillary service and/or IBE % of out-of-pocket spending when >0%	median (IQR)	77.1 (21.4-100.0)	25.4 (11.2-89.4)	32.7 (15.8-100.0)	25.6 (11.3-100.0)

Table 3.4 Frequencies and spending amounts of customarily provided ancillary service codes: anesthesia codes

Customary GIE ancillary service code	Bill type	Primary Endoscopy Provider: HOPD frequency, %	Primary Endoscopy Provider: HOPD $ median (10th-90th percentiles)	Primary Endoscopy Provider: ASC frequency, %	Primary Endoscopy Provider: ASC $ median (10th-90th percentiles)	Independent Billing Entity(s): HOPD frequency, %	Independent Billing Entity(s): HOPD $ median (10th-90th percentiles)	Independent Billing Entity(s): ASC frequency, %	Independent Billing Entity(s): ASC $ median (10th-90th percentiles)
Anesthesia assistance codes retired 12/31/2017		**3469 HOPD packages and 7327 ASC packages from 2012-13**							
00740 - Upper GIE anesthesia	professional	1.5	328 (196-536)	0.0		4.8	533 (309-700)	3.8	432 (328-581)
00810 - Lower GIE anesthesia	professional	1.8	493 (250-884)	0.0		13.3	577 (408-700)	9.8	440 (350-581)
All codes	**professional**	**3.3**	**503 (309-884)**	**0.0**		**18.1**	**565 (357-700)**	**13.5**	**433 (339-576)**
Anesthesia assistance codes since 1/1/2018		**3447 HOPD packages and 6508 ASC packages from 2018-19**							
00731 - Upper GIE anesthesia*	professional	3.0	381 (246-497)	2.1	303 (270-342)	6.6	606 (403-810)	0.9	589 (357-800)
00811 - Lower GIE anesthesia	professional	1.7	361 (225-490)	2.1	298 (261-333)	9.7	616 (403-810)	1.9	614 (438-800)
00812 - Lower GIE anesthesia for screening colonoscopy	professional	2.7	329 (212-429)	4.8	244 (212-293)	10.2	515 (321-709)	0.8	519 (352-715)
00813 - Combined upper and lower GIE anesthesia	professional	0.5	495 (293-660)	1.2	377 (329-425)	2.8	667 (471-900)	0.2	666 (408-900)
All codes	**professional**	**7.9**	**511 (326-720)**	**10.2**	**285 (221-360)**	**12.8**	**600 (355-800)**	**3.3**	**598 (378-720)**
Endoscopist delivered moderate (conscious) sedation anesthesia codes since 1/1/2017**									
G0500 - Initial 15 minutes intra-service time for colorectal cancer screening	professional	0.3	9 (7-11)	38.3	9 (6-10)	0.9	7 (7-7)	0.0	
	facility	16.2	78 (71-80)						
99152 - Initial 15 minutes intra-service time	professional	28.8	22 (17-24)	16.9	21 (18-22)	0.0		0.0	
	facility	2.1	46 (33-53)						
99153 - Each additional 15 minutes of intra-service time (billed with G0500 or 99152)	professional	1.6	17 (7-21)	4.9	16 (7-21)	0.0		0.0	
	facility	11.1	46 (33-67)						
All codes	**professional**	**29.2**	**23 (17-25)**	**55.2**	**14 (6-23)**	**0.9**	**7 (7-7)**	**0.0**	
	facility	**18.3**	**101 (50-146)**						

*CPTs 00731 and 00732 replaced 00740. CPT 00731 is used for most upper GIEs. CPT 00732 is rarely used for endoscopic retrograde cholangiopancreatography (ERCP). ** delivered by practitioner performing procedure with an independent observer

Table 3.5 Frequencies and spending amounts of customarily provided ancillary service codes: surgical pathology (883##) and injectable drug (J####) codes in use for entire data range, 2012-2019

		Primary Endoscopy Provider				Independent Billing Entity(s)			
		HOPD		ASC		HOPD		ASC	
Customary GIE ancillary service code	**Bill type**	**frequency, %**	**$ median (10th-90th percentiles)**	**frequency, %**	**$ median (10th-90th percentiles)**	**frequency, %**	**$ median (10th-90th percentiles)**	**frequency, %**	**$ median (10th-90th percentiles)**
Surgical pathology, 2012-2013		**3469 HOPD packages and 7327 ASC packages from 2012-13**							
88305 - Level IV - Surgical pathology, gross and microscopic examination	professional	0.1	488 (113-1126)	43.1	164 (59-354)	63.8	150 (55-303)	66.9	134 (52-235)
	facility	29.7	214 (80-402)						
88312 - Lab staining for microrganisms, interpretation, and report	professional	0.0		5.2	68 (64-70)	7.4	57 (37-96)	8.8	87 (24-203)
	facility	2.2	89 (69-138)						
88313 - Other lab stains not billed with 88312, interpretation, and report	professional	0.0	235 (235-235)	6.0	79 (53-116)	11.8	56 (16-119)	9.3	47 (11-104)
	facility	6.3	67 (34-144)						
88342 - Initial single antibody stain procedure, interpretation, and report	professional	0.0		0.0	324 (324-324)	8.6	110 (61-149)	2.7	186 (93-240)
	facility	1.7	126 (81-218)						
All codes	**professional**	**0.1**	**566 (113-1361)**	**43.1**	**175 (59-354)**	**64.0**	**185 (56-389)**	**66.8**	**181 (52-389)**
	facility	**29.7**	**238 (85-490)**						
Injectable drug codes, 2012-2013									
J2250 - midazolam hydrochloride, per 1 mg	facility	28.0	21 (2-41)						
J2704 - propofol, 10 mg	facility	0.0							
J3010 - fentanyl citrate, 0.1 mg	facility	15.2	12 (2-34)						
All codes	**facility**	**30.0**	**26 (4-49)**						

Table continued on next page

Table 3.5 Continued

Customary GIE ancillary service code	Bill type	Primary Endoscopy Provider: HOPD frequency, %	Primary Endoscopy Provider: HOPD $ median (10th-90th percentiles)	Primary Endoscopy Provider: ASC frequency, %	Primary Endoscopy Provider: ASC $ median (10th-90th percentiles)	Independent Billing Entity(s): HOPD frequency, %	Independent Billing Entity(s): HOPD $ median (10th-90th percentiles)	Independent Billing Entity(s): ASC frequency, %	Independent Billing Entity(s): ASC $ median (10th-90th percentiles)
Surgical pathology codes, 2018-2019		**3447 HOPD packages and 6508 ASC packages from 2018-19**							
88305 - Level IV - Surgical pathology, gross and microscopic examination	professional	2.6	168 (69-291)	56.7	92 (34-194)	67.1	158 (57-298)	76.0	128 (43-256)
	facility	18.0	198 (97-390)						
88312 - Lab staining for microrganisms, interpretation, and report	professional	0.1	66 (57-70)	2.9	77 (72-72)	1.0	72 (39-139)	4.0	63 (25-139)
	facility	0.1	96 (66-170)						
88313 - Other lab stains not billed with 88312, interpretation, and report	professional	0.1	51 (31-61)	0.4	63 (56-113)	0.6	50 (18-101)	2.5	101 (11-193)
	facility	0.2	138 (52-340)						
88342 - Initial single antibody stain procedure, interpretation, and report	professional	1.0	100 (91-91)	0.0		6.5	92 (62-171)	3.2	158 (91-171)
	facility	2.2	436 (107-581)						
All codes	**professional**	**2.6**	**276 (97-561)**	**56.7**	**91 (34-173)**	**67.2**	**231 (57-502)**	**75.1**	**138 (43-274)**
	facility	**19.6**	**223 (97-488)**						
Injectable drug codes, 2018-2019									
J2250 - midazolam hydrochloride, per 1 mg	facility	27.4	44 (3-145)						
J2704 - propofol, 10 mg	facility	10.0	109 (5-303)						
J3010 - fentanyl citrate, 0.1 mg	facility	39.5	30 (2-76)						
All codes	**facility**	**48.4**	**69 (5-224)**						

Patterns of who billed ancillaries shifted over time, which partially explains the decrease in IBE spending over time. The frequency of anesthesia assistance (AA) was almost unchanged between the periods for both HOPDs (21.0% of packages in 2012-2013 and 20.7% for 2018-2019) and ASCs (13.5% in both periods), but the share of AA billed by the principal endoscopy provider increased from 15% to 38% of packages in HOPDs and from 0% to 76% in ASCs, while the shares of AA billed by IBEs correspondingly decreased (Table 3.4). Per capita AA spending was almost unchanged because the shift in AA billing to the principal provider was offset by increased per-package spending for the AA billed by IBEs. Per capita total anesthesia spending increased between 2012-2013 and 2018-2019 because of the introduction of endoscopist performed anesthesia codes that began being used in 2017.

For HOPDs, surgical pathology billing shifted from principal providers to IBEs, but higher spending per billing for both biller types resulted in higher per capita surgical pathology spending (Table 3.5). For ASCs, both principal provider and IBE surgical pathology billing became more frequent, but lower billed amounts for each biller meant lower per capita surgical pathology spending.

Regression-adjusted spending

Regression-adjusted estimates were consistent with unadjusted patterns (Figure 3.1). From 2012 to 2019, adjusted mean GIE package spending in HOPDs increased $1,115 (from $2,295 to $3,410), while spending in ASCs increased $108 (from $1,336 to $1,444).

Trends were similar when I repeated the regressions and omitted ancillary and/or IBE spending.

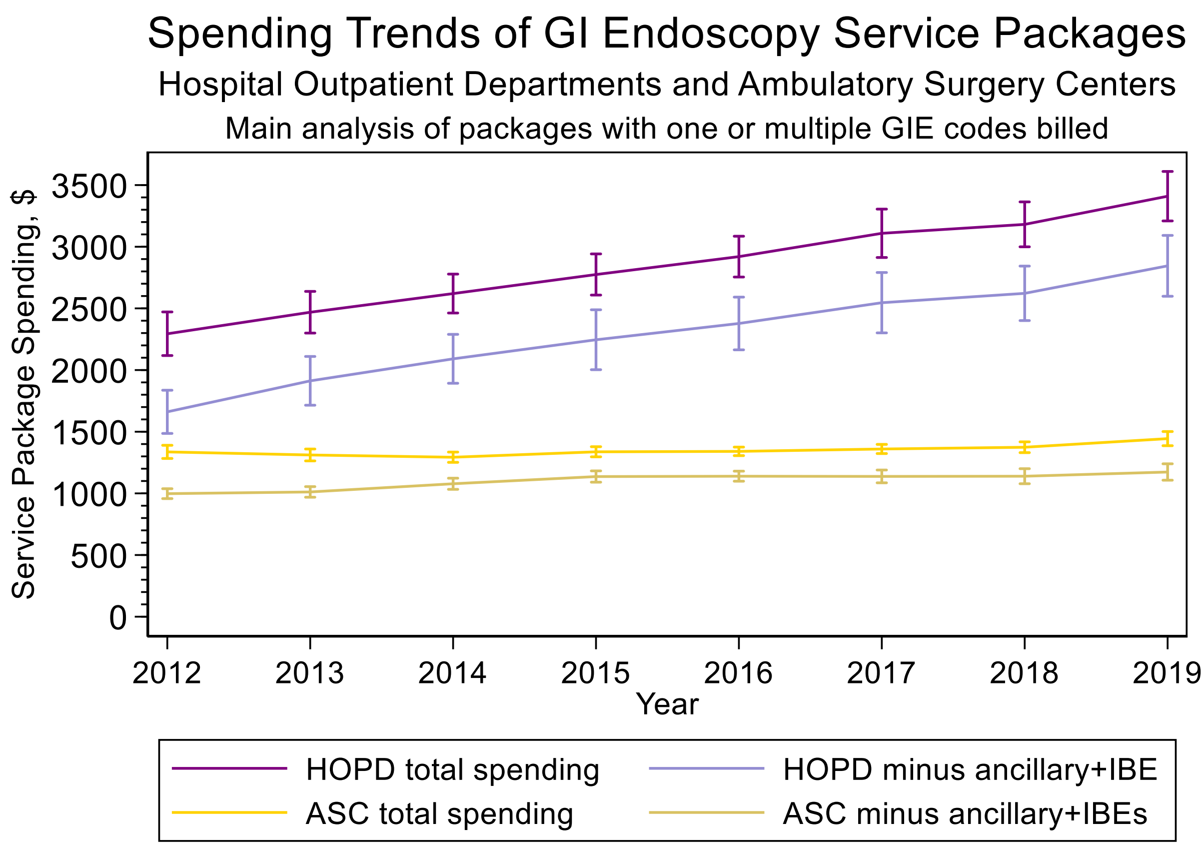

Figure 3.1 Regression Adjusted GIE Service Package Spending Trends With and Without Ancillary and Independent Billing Entity Spending in Hospital Outpatient Departments and Ambulatory Surgery Centers

In the sensitivity analysis, ASC packages showed similar spending trends whether they had one or multiple GIE codes billed (Figure 3.2). For HOPDs, however, spending grew faster for packages with multiple GIE codes billed, consistent with higher GIE code spending being the key driver of total package spending growth in HOPDs.

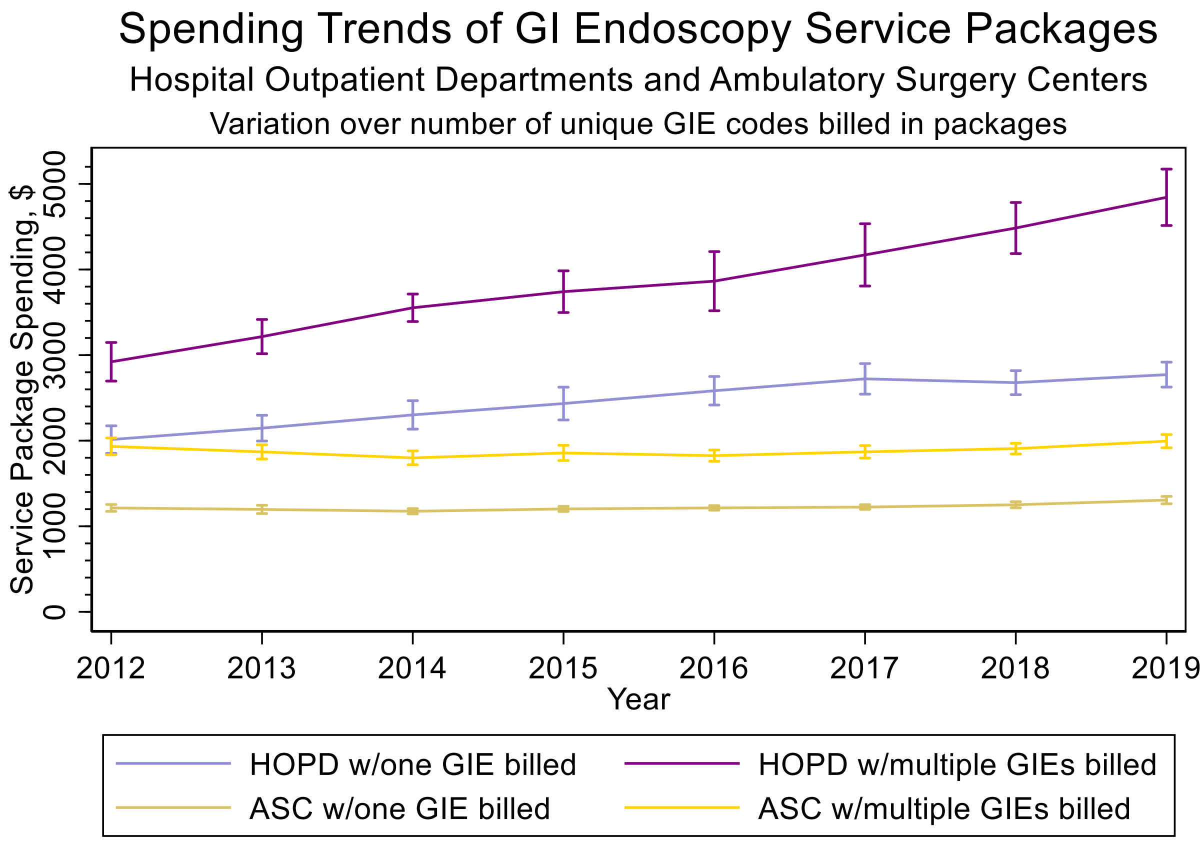

Figure 3.2 Regression Adjusted GIE Service Package Spending Trends in Hospital Outpatient Departments and Ambulatory Surgery Centers Stratified by Number of Endoscopy Codes Billed in Package

3.5 Discussion

I described how service code billing and spending amounts varied for nonemergency GIEs as an example of complex shoppable services delivered in HOPDs and ASCs. Most GIE service packages included ancillary services and IBE spending, but these amounts were too small for their omission from HOPD price estimates to make HOPDs appear price competitive with ASCs from 2012–2019. These findings demonstrate that accounting for how billing varies for a complex service is important for determining how to address excessive price variation including how to implement price transparency. In the study's population, greater savings were possible by shifting GIE delivery from HOPDs to ASCs than from improving hospital price transparency with complete ancillary and IBE spending estimates to enable shoppers to identify lower priced HOPDs.

Insurers might try to increase use of ASCs by educating enrollees about site of care price differences, although if enrollees' cost-sharing is similar for HOPDs and ASCs, they have little incentive to change settings as was the case for the study population. Notably, a large portion of GIEs are colonoscopies for colorectal cancer screening, which are generally exempt from cost-sharing, although unconventional insurance benefit designs are allowed that have out-of-pocket costs for some providers as long as enrollees have "adequate access to quality providers" (Department of Labor, Department of Health and Human Services and Department of the Treasury 2014). To incentivize use of lower cost GIE providers including for screening colonoscopies, reference pricing (Robinson, Brown et al. 2015, Aouad, Brown and Whaley 2019) and tiered provider networks (Ackley 2022) have generated substantial savings. Direct financial payments to patients have also been used to incentivize choosing lower-priced GIE providers, although evidence is more limited (Whaley, Sood et al. 2021).

GIE packages in the data had lower ancillary and IBE spending than reported in a national multi-insurer commercial claims database (Horný, Shafer and Dusetzina 2021). Horný, Shafer, and Dusetzina reported IBE spending in hospital-based GIE episodes in 2018 that was higher for four of five GIE codes than this study's 2018 HOPD packages ranging from $356 higher for CPT 45378 ($670 vs. $314) to $820 higher for CPT 45385 ($957 vs. $137) and was $16 less for CPT 45325 ($464 vs. $480).

Lower IBE spending in this study is partly explained by lower AA use, which was typically the most expensive customary ancillary service and was sometimes billed by IBEs. AA is generally unnecessary for low-risk GIEs, and reducing its use is a recognized target for improving efficiency (Krigel, Chen et al. 2019, Adams, Gao et al. 2022). In national datasets, AA use in GIEs rose sharply around the study's time range from 38.5% in 2010 to 77.7% in the fourth quarter of 2019 (Predmore, Nie et al. 2017, Adams, Gao et al. 2022), but AA use in this study was essentially the same in 2012–2013 and 2018–2019 for each HOPDs and ASCs. Given that independently billed AA in 2018–2019 HOPD packages had a median cost of about $600 per package, the higher AA utilization described in national studies could plausibly explain three hundred dollars of the differences in per capita IBE spending between these findings and those of Horný, Shafer, and Dusetzina. In 2018-2019 in our data, IBEs billed AA for 62% of HOPD package, so another reason for the higher IBE spending found by Horný, Shafer, and Dusetzina could be if their data had a higher rate of IBEs billing AA vs. HOPDs billing AA. Thus, both site-of-care selection and treatment intensity of ancillaries, especially AA, are important determinants of IBE and total service package spending.

Current federal transparency mandates incompletely address the utilization and billing dynamics of complex services. The hospital price transparency rule requires hospitals to disclose total price estimates for shoppable service packages but allows discretion in defining "customary" ancillaries and does not require inclusion of IBE bills, limiting comparability across hospitals. The executive order that created the hospital price transparency mandate also created an insurer price transparency mandate—the Transparency in Coverage Rule (Internal Revenue Service, Employee Benefits Security Administration and Department of Health and Human Services 2020)— that requires insurers provide member-specific out-of-pocket estimates for individual service items for all providers including ASCs, which better supports shopping than hospital-only service package price disclosures. However, it does not require insurers to publish all-inclusive prices that incorporate ancillaries and IBE spending. Also, neither mandate causes disclosure of cash prices of ASCs and other non-hospital providers, which are relevant for uninsured patients and for insured patients facing high cost sharing.

To meaningfully improve shopping for complex services, policymakers could pair site-of-care incentives with more structured episode-level transparency. Hospitals and other providers could be required to report standardized spending estimates for typical care scenarios that include specified ancillaries and an estimate of IBE spending. Insurers could similarly report standardized package prices and member-specific out-of-pocket estimates. Only providers have complete data on packages they delivered, so they are best positioned to report how often they billed specific ancillary codes in packages; such frequency information would help explain the variability of all-inclusive service package spending. In this single-insurer data, most non-GIE services had too few observations to analyze ancillary variation, underscoring the advantage of provider-based reporting for complex episodes.

Limitations

I note limitations in the study design and findings. First, I analyzed service packages billed to one insurer in a single region, where ancillary spending, IBE spending, and AA utilization were lower than in national datasets, so the findings may not generalize to other settings or clinical services. Second, the observational design without random assignment to care settings means that estimated differences between HOPDs and ASCs are subject to residual confounding despite covariate adjustment. HOPDs are often preferred for higher-risk patients, and I had limited clinical detail to distinguish health risk factors influencing referrals to HOPDs.

To limit case-mix differences between settings, I used novel referral authorization data to restrict the population to packages with a single preceding non-urgent referral for a GIE code and no extraneous referrals recorded on claims in the GIE service package. Nonetheless, unmeasured confounding may remain. Stratified analyses by a richer patient risk measure would better separate excess spending attributable to low-risk patients receiving GIEs in HOPDs from spending differences driven by appropriate risk stratification.

3.6 Conclusion

GIE service package spending in HOPDs greatly exceeded spending in ASCs, and this gap grew markedly from 2012 to 2019. The difference in total spending between settings was much larger than the contribution of ancillary services and IBE spending and omitting these components from HOPD price estimates would not have made HOPDs appear price competitive with ASCs. Policies that help patients and insurers steer shoppable complex procedures to lower-cost settings could achieve greater savings than efforts focused solely on making hospital package price estimates more complete. Policymakers should consider complementary strategies that both improve episode-level price transparency for complex services and enable insurers to design benefits that encourage use of lower-cost sites such as ASCs, while maintaining access to HOPDs for patients who need higher-acuity care.

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Chapter 4. The Implications of Vertical Integration and Self-Referral for Price Transparency Efforts Targeting Gastrointestinal Endoscopy

4.1 Abstract

Introduction: Over half of physicians now work for hospitals or health systems. Health system vertical integration with evaluation and management clinicians generally discourages price shopping for referred services as health systems seek to retain referred services business. In this chapter, my objective was to evaluate how much GIE utilization and spending varied across referral relationship types: referrals between vertically integrated providers (VIRs), referrals between non-vertically integrated providers (non-VIRs), and endoscopist self-referrals (ESRs).

Methods: I summarized characteristics of GIE referral authorizations, recipients of GIE referrals, and GIE service packages of each referral relationship type over time. I estimated regression adjusted values of total and out-of-pocket GIE service package spending and five utilization characteristics outcomes.

Results: From 2012 to 2019, the share of non-VIR packages decreased from 65.9% to 56.3% while ESR packages increased from 13.5% to 21.6% and the VIR packages increased from 20.7% to 22.1%. Non-VIR package spending grew $174 (from $1547 to $1721) while VIR package spending grew $839 (from $1771 to $2610) and ESR package spending grew $1127 (from $1916 to $3043). In regression adjusted estimates, differences across referral relationship types were mostly eliminated after controlling for the referred provider. Most

utilization characteristics did not differ across referral relationship types with the exception of package delivery in a hospital outpatient department which was two to three times more common for VIRs and ESRs than for non-VIRs each year.

Conclusion: GIE service package spending increases for VIRs and ESRs appear to be predominantly driven by price increases for the providers and HOPD facilities that more frequently delivered VIR and ESR packages. To reduce GIE spending, payers should explore how to increase non-VIRs to ASCs for lower risk GIEs that do not need to be delivered in HOPDs.

4.2 Introduction

When a privately insured patient obtains a referred health care service, their referring practitioner's provider choice has care quality and cost implications. Historically, practitioners have referred patients for a given service to a small number of providers who the referring practitioner trusted from their professional experience (Chernew, Cooper et al. 2021, Agha, Ericson et al. 2022), which can have benefits. In some analyses, primary care providers who referred to fewer specialists had lower costs and no reduction in quality (Agha, Ericson et al. 2022, Agha, Ericson and Zhao 2023), which may be due to providers coordinating more efficiently after previously sharing patients. However, practitioners who only rely on their professional experience and judgement may overlook or avoid provider options that are higher quality, lower cost, or more convenient for the patient (Chernew, Cooper et al. 2021).

For some referred services for which quality varies little across providers, spending would be reduced by as much as half if patients who used higher priced providers instead used lower priced providers (Desai, Hatfield et al. 2019, Chernew, Cooper et al. 2021). In response to excessive price variation, price transparency initiatives proliferated to stimulate price shopping and price competition including both initiatives voluntarily undertaken by insurers or employers (Whaley, Schneider Chafen et al. 2014, Desai, Hatfield et al. 2016, Desai, Hatfield et al. 2017, Whaley 2019, Philips and Whaley 2025) and transparency mandated by states (Brown 2018, Murray, Tessitore et al. 2020) and the federal government (Centers for Medicare and Medicaid Services 2019, Felt-Lisk, Ballou and Lake 2020, Internal Revenue Service, Employee Benefits Security Administration and Department of Health and Human Services 2020). However, price transparency by itself has not substantially increased price shopping for most services (Sinaiko, Joynt and Rosenthal 2016, Desai, Shambhu and Mehrotra 2021) or realized more than a small amount of the maximum potential savings (Brown 2018, Desai, Hatfield et al. 2019, Whaley 2019, Chernew, Cooper et al. 2021, Zhao and Berman 2023).

An important countervailing force limiting the effects of price transparency is increasing vertical integration of ever larger health systems that employ clinicians who refer services that are delivered in facilities operated by their employer. This issue is widespread because 59.7% of physicians now work for hospitals or health systems as of early 2026 (Physicians Advocacy Institute 2026), an increase from 26% in 2012 (Physicians Advocacy Institute 2019). After health systems acquire outpatient clinics or hospitals, clinicians from the acquired entities more often refer for services to the health system's facilities (Baker, Bundorf and Kessler 2016, Carlin, Feldman and Dowd 2016, Richards, Seward and Whaley 2021), which are usually hospital outpatient departments (HOPDs) for referred outpatient services instead of generally lower cost ambulatory surgery centers (ASCs) (Carey 2015, Carey 2017). By making health systems more indispensable in their local markets, vertical integration has usually caused price and spending increases (Post, Buchmueller and Ryan 2018, Curto, Sinaiko and Rosenthal 2022, Harris, Philbin et al. 2025).

Because vertically integrated health systems seek to direct referrals from their employed clinicians to facilities in the system, vertical integration is in conflict with efforts to implement price transparency to stimulate price shopping. Evidence on the conflict between vertical integration and price transparency is incomplete (Bernstein and Crowe 2024, Harris, Philbin et al. 2025). In this study, I used novel referral authorization data to identify referrals when the referring and referred practitioners were from the same vertically integrated provider organization, which I term vertically integrated referrals (VIRs), compared to referred services that were not VIRs and compared to endoscopist self-referrals (ESRs). Actual referral records are more accurate than referral relationships deduced from claims data. The study objective was to evaluate how gastrointestinal endoscopy (GIE) utilization and spending—a target procedure category for reducing excessive price variation—varied across VIRs, non-VIRs, and ESRs.

4.3 Methods

This chapter's analyses also evaluated the KPWA GIE referrals and service package data from 2012-2019 described in Section 2.3.

Referral Relationship Types

I used practitioner and provider organization numeric identifiers in the referral authorization data to identify referral relationships. I identified endoscopist self-referrals when an endoscopist was both the referring and referred practitioner of a GIE referral authorization. When a referral was not an ESR, I identified referrals that were VIRs when the referring and referred practitioners had the same provider organization identifier. To determine if an ESR was vertically integrated in the way I determine if a non-ESR is vertically integrated, I would need to observe the practitioner who referred the patient to the self-referring endoscopist, which was only sometimes present in the data. I evaluated ESRs as a third category separate from VIRs and non-VIRs because ESRs are plausibly clinically distinct from non-ESRs; ESRs have higher raw spending than VIRs and non-VIRs; and ESRs are similarly as common as VIRs. Service claim records include a field noting if a referral numeric identifier was related to a claim, which I used to identify referrals that are *linked* to service packages.

Population

This chapter's analyses used similar referrals and service package inclusion criteria as Chapter Three. From January 2012 through August 2019, 67,977 referral authorizations for the five most common GIE codes met eligibility criteria referred to 45,114 KPWA members. I excluded 3.1% of referrals (2206) that were either noted as urgent/expedited or retrospective (1689) and/or were not referred from or to any of KPWA's predominant contracted network of providers (568).

This chapter's analyses used the same service package eligibility criteria as Chapter Three except that in Chapter Four analyses, I excluded 6137 packages (12.0%) because a package did not have only one linked GIE referral code without any non-linked GIE referral within 120 days before the package date. This exclusion is more restrictive than the exclusion of packages with more than one preceding referral in Chapter Three, which included packages that had a preceding referral that was not linked to a package claim. I limited the analyses in this chapter to packages with one recorded GIE referral code to be certain of each package's referral relationship type. From January 2012 through September 2019, the KPWA membership subset had 40,319 packages that met all study inclusion criteria from 33,594 members delivered at 45 facilities operated by 36 provider organizations. I excluded 11,033 (21.5%) GIE service packages that did not meet all inclusion criteria. Table 4.1 and Table 4.2 contain the full list of exclusions, frequencies of each exclusion overall and separately for each referral relationship type, and average spending amounts for packages with each exclusion.

Table 4.1 GIE Service Package Exclusion Criteria for All Packages Analyzed in Chapter Four

	n	**%**	**Median Package Spending**	**Mean Package Spending**
Package did not have only one linked GIE referral code and no other preceding GIE referrals within 120 days	6137	12.0	2348	2784
Unable to identify package's provider organization or location	2377	4.6	2099	2772
Referral in package for a billing code that was not one of the five shoppable GIEs, a GIE anesthesia code, an evaluation and management code (CPTs 99202-99499), or a three-digit UB-04 institutional provider revenue code (form locator 42)	1317	2.6	2571	2876
Urgent/expedited or retrospective referral in package	1379	2.7	2696	3497
Package delivered outside the study geographic area	932	1.8	2090	2961
Inpatient hospital bill in package	584	1.1	2626	4251
Emergency bill in package or in the prior two weeks	1185	2.3	2014	3139
Member had a cognitive impairment, dementia, or psychosis diagnosis within 12 months before the package	84	0.16	1907	2635
All packages with one or more exclusion criteria	11033	21.5	2275	2746
All packages with zero exclusion criteria	40319	78.5	1547	1897

Table 4.2 GIE Service Package Exclusion Criteria by Referral Relationship Type

	Exclusions for non-vertically integrated packages				**Exclusions for vertically integrated packages**				**Exclusions for self-referred packages**			
	n	**%**	**Median Package Spending**	**Mean Package Spending**	**N**	**%**	**Median Package Spending**	**Mean Package Spending**	**n**	**%**	**Median Package Spending**	**Mean Package Spending**
Package did not have only one linked GIE referral code and no other preceding GIE referrals within 120 days	4383	14.1	2088	2498	846	8.8	3093	3370	908	8.6	3245	3614
Unable to identify package's provider organization or location	1268	4.1	2048	2719	593	6.1	2266	2807	516	4.9	2148	2863
Referral in package for a billing code that was not one of the five shoppable GIEs, a GIE anesthesia code, an evaluation and management code (CPTs 99202-99499), or a three-digit UB-04 institutional provider revenue code (form locator 42)	127	0.4	1522	1894	175	1.8	2766	3299	1015	9.6	2624	2926
Urgent/expedited or retrospective referral in package	844	2.7	2328	3317	239	2.5	2824	3432	296	2.8	3290	4060
Package delivered outside the study geographic area	602	1.9	2025	2888	130	1.4	2789	3824	200	1.9	1967	2618
Inpatient hospital bill in package	274	0.9	2672	4726	187	1.9	2380	3606	123	1.2	2819	4172
Emergency bill in package or in the prior two weeks	684	2.2	1598	2832	222	2.3	2552	3553	279	2.6	2866	3561
Member had a cognitive impairment, dementia, or psychosis diagnosis within 12 months before the package	44	0.14	1417	1680	12	0.12	2387	4121	28	0.26	3015	3498
All packages with one or more exclusion criteria	6374	20.5	1991	2453	1963	20.3	2672	3114	2696	25.5	2721	3171
All packages with zero exclusion criteria	24748	79.5	1407	1620	7693	79.7	1918	2159	7878	74.5	2255	2508

Statistical Analysis

I first summarized characteristics of GIE referral authorizations, recipients of GIE referrals, and GIE service packages of each referral relationship type in 2012-2015 and 2016-2019. I estimated how much seven utilization and spending outcomes varied across referral relationship types using generalized linear model (GLM) regressions that I adjusted for potentially influential covariates. The dependent variables were five binary events—(1) whether a GIE referral was linked to a subsequent GIE service package; (2) whether a GIE service package occurred within 120 days after a GIE referral; (3) whether a GIE package was delivered in a HOPD; (4) whether the referred GIE code was billed in the subsequent GIE service package; and (5) whether multiple GIE codes were billed in a service package —and two spending dependent variables—(6) total service package spending and (7) out-of-pocket service package spending. The analytic sample for the first two binary event dependent variables regarding whether a GIE was billed after a referral was all referral authorizations including those without a subsequent GIE delivered. For the other binary event dependent variables and the spending dependent variables, the analytic sample was referrals that have a subsequent service package.

In each GLM, the primary explanatory variable was a three-category variable indicating a GIE referral's relationship type or the relationship type of the referral linked to a service package. The regressions also controlled for referred GIE code fixed effects, year fixed effects, referred provider organization fixed effects (a set of binary variables that specifies the combinations of referred professional and facility provider organizations), and referral recipient-specific control variables—age categories, sex, and member residence county fixed effects. I omitted the referred provider organization fixed effects when the dependent variable was whether a GIE package was delivered in a HOPD because referred provider organization is highly and sometimes perfectly correlated with whether a package was delivered in a HOPD, so the referred provider fixed effects and primary explanatory variable are collinear. I did not adjust the regressions for the GIE code(s) billed in the service package because referral relationship type may influence the GIE code(s) billed.

For the binary dependent variables, I used GLM logistic regressions (logit link and binomial variance functions), which is generally appropriate for binary dependent variables in health economics and health services research (Norton and Dowd 2018). For total service package spending, I used a log-inverse gaussian model which performed best on standard diagnostics for deciding the GLM link function (Ramsey 1969, Pregibon 1980) and distribution family (Park 1966). For out-of-pocket service package spending, I used a two-part model to handle the substantial point mass of service packages with no out-of-pocket spending (Belotti, Deb et al. 2015, Deb and Norton 2018). For the first part of the two-part model that predicted whether a package had any out-of-pocket spending, I used a logistic regression. For the second part of the two-part model that predicted the amount of out-of-pocket spending conditional on it being positive, I used a log-gaussian GLM that performed best on standard diagnostics for the GLM link function and distribution family. For each dependent variable, I used the regression results to prepare a bar chart showing adjusted dependent variable values and 95% confidence interval for each referral relationship type each year.

I conducted sensitivity analyses that omitted the referred provider organization fixed effects for all outcomes except for whether a GIE package was delivered in a HOPD which was not adjusted for referred provider organization fixed effects in the main analysis. By controlling referred provider fixed effects in the primary models, I eliminated confounding of the effects of referral relationship types because of variation in how likely provider organizations were to be a participant in each referral relationship type.

4.4 Results

Among the eligible GIE referrals, 60.2% (40,902) were non-VIRs, 19.3% (13,116) were VIRs, and 20.5% (13,959) were ESRs (Table 4.3). Among eligible GIE service packages that were linked to a single GIE referral, 61.4% (24,748) were linked to a non-VIR; 19.1% (7,693) were linked to a VIR; and 19.5% (7,878) were linked to an ESR (Table 4.4 and Table 4.5). From 2012 to 2019, the share of packages linked to non-VIRs decreased from 65.9% to 56.3% while the share of packages linked to ESRs increased from 13.5% to 21.6% and the share of packages linked to VIRs increased from 20.7% to 22.1% (Figure 4.1).

Characteristics of GIE referral authorizations

In both time periods, the frequencies of which GIE code was referred varied widely across the referral relationship types. For referrals of either of the two most common upper GIE codes, >70% of non-VIR referrals were CPT 43239 while 60-75% of VIRs and ESRs were CPT 43235. For referrals of the three most common lower GIE codes, CPT 45380 was usually the most common code, but CPTs 45378 and 45385 were more common for VIRs than non-VIRs and were most common for ESRs

Table 4.3 Characteristics of GIE Referral Authorizations by Referral Relationship Type and Period

			2012-2015			2016-2019		
			Non-VIR N=22,506	**VIR N=6,602**	**ESR N=5,470**	**Non-VIR N=18,396**	**VIR N=6,514**	**ESR N=8,489**
Referred endoscopy CPT code	**43235**	n (%)	1,386 (6.2%)	923 (14.0%)	917 (16.8%)	1,031 (5.6%)	772 (11.9%)	1,488 (17.5%)
	43239		3,638 (16.2%)	452 (6.8%)	293 (5.4%)	2,896 (15.7%)	521 (8.0%)	598 (7.0%)
	45378		2,846 (12.6%)	1,418 (21.5%)	1,456 (26.6%)	3,429 (18.6%)	1,783 (27.4%)	3,412 (40.2%)
	45380		14,519 (64.5%)	3,712 (56.2%)	2,690 (49.2%)	10,812 (58.8%)	3,267 (50.2%)	2,546 (30.0%)
	45385		117 (0.5%)	97 (1.5%)	114 (2.1%)	228 (1.2%)	171 (2.6%)	445 (5.2%)
Age		mean (sd)	53.3 (9.3)	53.4 (9.1)	53.3 (9.1)	53.9 (9.3)	53.9 (9.5)	53.3 (10.0)
Age groups	**18-35**	n (%)	1,531 (6.8%)	440 (6.7%)	346 (6.3%)	1,195 (6.5%)	433 (6.6%)	716 (8.4%)
	36-49		3,415 (15.2%)	904 (13.7%)	860 (15.7%)	2,608 (14.2%)	905 (13.9%)	1,256 (14.8%)
	50-54		6,262 (27.8%)	2,075 (31.4%)	1,556 (28.4%)	4,667 (25.4%)	1,633 (25.1%)	2,031 (23.9%)
	55-59		5,475 (24.3%)	1,506 (22.8%)	1,308 (23.9%)	4,208 (22.9%)	1,497 (23.0%)	1,901 (22.4%)
	60-64		5,823 (25.9%)	1,677 (25.4%)	1,400 (25.6%)	5,718 (31.1%)	2,046 (31.4%)	2,585 (30.5%)
Female		n (%)	12,865 (57.2%)	3,758 (56.9%)	3,070 (56.1%)	10,316 (56.1%)	3,661 (56.2%)	4,876 (57.4%)
Elixhauser Comorbidity Score		mean (sd)	0.6 (3.6)	0.5 (3.6)	0.7 (3.9)	0.7 (4.2)	0.5 (4.3)	1.0 (4.7)
Residence in non-metro area		n (%)	3,052 (13.6%)	1,491 (22.7%)	926 (17.0%)	3,077 (16.8%)	1,459 (22.5%)	1,305 (15.4%)
Estimated drive time to endoscopist		median (IQR)	31.9 (23.1-45.8)	33.5 (22.4-46.3)	37.1 (26.9-47.3)	34.5 (25.3-46.0)	33.5 (22.4-46.0)	35.6 (25.5-49.1)
Plan type	**HMO**	n (%)	15,402 (68.4%)	4,760 (72.1%)	3,698 (67.6%)	15,442 (83.9%)	5,546 (85.1%)	7,265 (85.6%)
	POS		6,697 (29.8%)	1,772 (26.8%)	1,534 (28.0%)	2,406 (13.1%)	769 (11.8%)	827 (9.7%)
	PPO		404 (1.8%)	70 (1.1%)	238 (4.4%)	547 (3.0%)	199 (3.1%)	397 (4.7%)
Plan purchaser	**Commercial**	n (%)	18,065 (80.3%)	5,341 (80.9%)	4,478 (81.9%)	12,400 (67.4%)	4,360 (66.9%)	5,773 (68.0%)
	I&Fs		3,336 (14.8%)	930 (14.1%)	749 (13.7%)	4,627 (25.2%)	1,703 (26.1%)	2,114 (24.9%)
	Small Biz		1,102 (4.9%)	331 (5.0%)	243 (4.4%)	1,368 (7.4%)	451 (6.9%)	602 (7.1%)

VIR: vertically integrated referral; ESR: endoscopist self-referral; CPT: current procedural terminology; HMO: health maintenance organization; POS: point-of-service; PPO: preferred provider organization; I&Fs: Individuals and Families.

Table continued on next page.

Table 4.3 Continued

			2012-2015			2016-2019		
			Non-VIR N=22,506	**VIR N=6,602**	**ESR N=5,470**	**Non-VIR N=18,396**	**VIR N=6,514**	**ESR N=8,489**
Individual Annual Deductible In-Network		median (IQR)	250 (0-500)	250 (100-500)	250 (0-500)	250 (150-1500)	250 (175-1400)	250 (175-1150)
Individual Annual Deductible In-Network	**$0**	n (%)	6,126 (27.2%)	1,560 (23.6%)	1,404 (25.7%)	2,860 (15.6%)	941 (14.5%)	1,454 (17.1%)
	$50-250		6,909 (30.7%)	1,911 (28.9%)	1,608 (29.4%)	7,003 (38.1%)	2,683 (41.3%)	3,147 (37.1%)
	$275-900		5,362 (23.8%)	1,956 (29.6%)	1,539 (28.2%)	3,249 (17.7%)	1,033 (15.9%)	1,476 (17.4%)
	$1000-2500		2,800 (12.4%)	841 (12.7%)	621 (11.4%)	2,549 (13.9%)	862 (13.3%)	1,222 (14.4%)
	$2600-7900		1,297 (5.8%)	334 (5.1%)	294 (5.4%)	2,714 (14.8%)	979 (15.1%)	1,181 (13.9%)
Individual Out-of-Pocket Limit In-Network		median (IQR)	2000 (1000-2100)	2000 (1150-2100)	2000 (1000-2100)	2750 (2000-5750)	3000 (2000-5750)	3000 (2000-5700)
Individual Out-of-Pocket Limit In-Network	**$0**	n (%)	3,377 (15.0%)	951 (14.4%)	813 (14.9%)	1,014 (5.5%)	319 (4.9%)	568 (6.7%)
	$700-1900		5,544 (24.6%)	1,070 (16.2%)	1,136 (20.8%)	3,209 (17.5%)	922 (14.2%)	1,352 (15.9%)
	$2000-2800		8,680 (38.6%)	3,135 (47.5%)	2,387 (43.7%)	4,976 (27.1%)	1,848 (28.4%)	2,309 (27.2%)
	$3000-5000		2,729 (12.1%)	805 (12.2%)	629 (11.5%)	4,045 (22.0%)	1,600 (24.6%)	1,956 (23.1%)
	$5100-10000		2,164 (9.6%)	641 (9.7%)	501 (9.2%)	5,131 (27.9%)	1,809 (27.8%)	2,295 (27.1%)
Days remaining in plan year		median (IQR)	175 (84-270)	182 (92-276)	176 (89-265)	199 (104-284)	201 (104-285)	191 (105-277)
Referral is linked to a GIE package		n (%)	17,674 (78.5%)	5,447 (82.5%)	4,348 (79.5%)	15,232 (82.8%)	5,352 (82.2%)	6,898 (81.3%)
GIE code billed within 120 days after referral authorization		n (%)	17,304 (76.9%)	5,336 (80.8%)	3,833 (70.1%)	14,513 (78.9%)	5,247 (80.5%)	6,593 (77.7%)
GIE referral linked to claim for same GIE code		n (%)	8,348 (37.1%)	2,117 (32.1%)	1,753 (32.0%)	6,336 (34.4%)	2,028 (31.1%)	2,211 (26.0%)
Referral is linked to a package with multiple unique GIE codes		n (%)	4,534 (20.1%)	1,370 (20.8%)	1,268 (23.2%)	3,686 (20.0%)	1,417 (21.8%)	2,140 (25.2%)

Table 4.4 Spending Characteristics of Upper Entry GIE Packages by Referral Relationship Type and Period

			Non-VIR		VIR		ESR	
			2012-15 N=2,648	2016-19 N=1,988	2012-15 N=698	2016-19 N=561	2012-15 N=617	2016-19 N=932
Total service package spending		mean (sd)	1500 (753)	1572 (1071)	2015 (1038)	2509 (1320)	2035 (958)	2689 (1490)
		median (IQR)	1301 (1077-1663)	1269 (1111-1602)	1776 (1314-2519)	2235 (1490-3104)	1996 (1246-2542)	2677 (1604-3134)
Service package insurer payment		mean (sd)	1235 (783)	1187 (1063)	1700 (1073)	2015 (1380)	1745 (976)	2180 (1500)
		median (IQR)	1092 (823-1452)	1040 (780-1354)	1513 (1017-2240)	1820 (1140-2718)	1710 (1005-2248)	2147 (1103-2840)
Package had out-of-pocket payment(s)		n (%)	2,510 (94.8%)	1,803 (90.7%)	664 (95.1%)	502 (89.5%)	560 (90.8%)	835 (89.6%)
Out-of-pocket amount when >$0		mean (sd)	278 (360)	418 (505)	313 (416)	541 (703)	291 (403)	557 (782)
		median (IQR)	182 (75-294)	200 (137-476)	200 (75-346)	259 (150-692)	200 (68-307)	200 (150-662)
Service package had deductible spending		n (%)	582 (22.0%)	608 (30.6%)	162 (23.2%)	165 (29.4%)	120 (19.4%)	262 (28.1%)
Service package deductible amount when >$0		median (IQR)	408 (184-986)	750 (200-1211)	295 (172-872)	750 (250-1231)	350 (191-894)	654 (250-1621)
Service package had coinsurance spending		n (%)	923 (34.9%)	773 (38.9%)	217 (31.1%)	222 (39.6%)	211 (34.2%)	358 (38.4%)
Service package coinsurance amount when >$0		median (IQR)	193 (117-268)	188 (111-254)	235 (123-352)	315 (209-501)	208 (112-348)	296 (166-512)
Service package had copay spending		n (%)	1,771 (66.9%)	1,127 (56.7%)	493 (70.6%)	291 (51.9%)	415 (67.3%)	531 (57.0%)
Service package copay amount when >$0		median (IQR)	50 (20-150)	75 (25-150)	100 (30-200)	100 (40-200)	50 (20-150)	100 (30-200)
% of package spending that was cost-sharing	No cost-sharing	n (%)	138 (5.2%)	185 (9.3%)	34 (4.9%)	59 (10.5%)	57 (9.2%)	97 (10.4%)
	Some cost-sharing		2,408 (90.9%)	1,631 (82.0%)	647 (92.7%)	460 (82.0%)	544 (88.2%)	777 (83.4%)
	Full cost-sharing		102 (3.9%)	172 (8.7%)	17 (2.4%)	42 (7.5%)	16 (2.6%)	58 (6.2%)

Table 4.5 Spending Characteristics of Lower Entry GIE Packages by Referral Relationship Type and Period

			Non-VIR		VIR		ESR	
			2012-15 N=10,765	2016-19 N=9,347	2012-15 N=3,309	2016-19 N=3,125	2012-15 N=2,648	2016-19 N=3,681
Total service package spending		**mean (sd)**	1625 (789)	1659 (787)	1990 (948)	2308 (1242)	2199 (1107)	2764 (1541)
Total service package spending		**median (IQR)**	1407 (1155-1904)	1475 (1197-1923)	1812 (1285-2385)	2076 (1396-2753)	2008 (1368-2723)	2541 (1593-3308)
Service package insurer payment		**mean (sd)**	1443 (802)	1481 (829)	1809 (944)	2107 (1265)	2026 (1084)	2550 (1515)
Service package insurer payment		**median (IQR)**	1246 (1004-1685)	1352 (1072-1715)	1647 (1151-2240)	1882 (1249-2611)	1874 (1213-2556)	2390 (1433-3162)
Package had out-of-pocket payment(s)		**n (%)**	5,989 (55.6%)	3,856 (41.3%)	1,678 (50.7%)	1,327 (42.5%)	1,315 (49.7%)	1,530 (41.6%)
Out-of-pocket amount when >$0		**mean (sd)**	324 (424)	428 (560)	307 (412)	469 (702)	299 (420)	508 (704)
Out-of-pocket amount when >$0		**median (IQR)**	199 (75-367)	200 (65-496)	200 (75-363)	200 (75-505)	166 (75-340)	200 (100-605)
Service package had deductible spending		**n (%)**	2,129 (19.8%)	1,937 (20.7%)	610 (18.4%)	674 (21.6%)	447 (16.9%)	706 (19.2%)
Service package deductible amount when >$0		**median (IQR)**	303 (129-856)	280 (98-1116)	250 (110-517)	250 (99-926)	211 (100-533)	356 (138-930)
Service package had coinsurance spending		**n (%)**	2,429 (22.6%)	1,598 (17.1%)	586 (17.7%)	477 (15.3%)	517 (19.5%)	681 (18.5%)
Service package coinsurance amount when >$0		**median (IQR)**	182 (100-266)	159 (66-261)	210 (78-344)	199 (64-380)	180 (77-317)	219 (87-459)
Service package had copay spending		**n (%)**	3,567 (33.1%)	1,631 (17.4%)	1,036 (31.3%)	541 (17.3%)	793 (29.9%)	691 (18.8%)
Service package copay amount when >$0		**median (IQR)**	50 (20-150)	75 (25-150)	75 (20-150)	150 (50-200)	75 (20-150)	75 (25-150)
% of package spending that was cost-sharing	**No cost-sharing**	**n (%)**	4,776 (44.4%)	5,491 (58.7%)	1,631 (49.3%)	1,798 (57.5%)	1,333 (50.3%)	2,151 (58.4%)
	Some cost-sharing		5,793 (53.8%)	3,546 (37.9%)	1,651 (49.9%)	1,253 (40.1%)	1,293 (48.8%)	1,477 (40.1%)
	Full cost-sharing		196 (1.8%)	310 (3.3%)	27 (0.8%)	74 (2.4%)	22 (0.8%)	53 (1.4%)

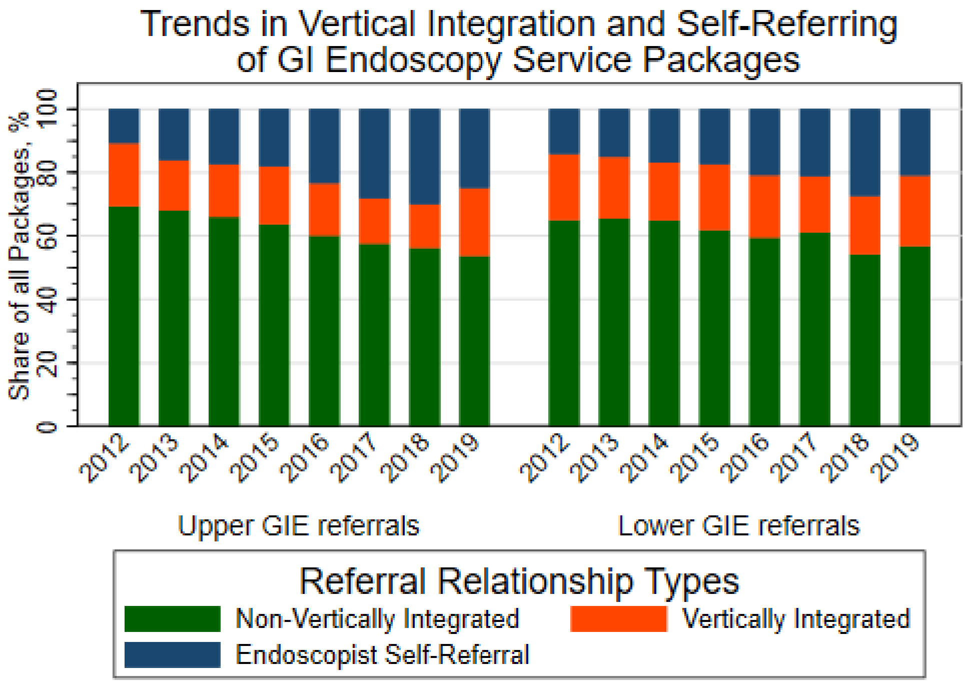

Figure 4.1 GIE Referral Relationship Trends

Characteristics of GIE Service Packages

In both time periods and for both upper and lower GIEs, mean GIE service package spending was lowest for packages linked to a non-VIR, hundreds of dollars greater for VIRs, and greatest for ESRs (Table 4.4 and Table 4.5). From the 2012-2015 to 2016-2019, most of the total spending change was due to increases for VIRs and ESRs: mean non-VIR package spending only increased $72 for upper GIE packages ($1500 to $1572) and increased $34 for lower GIE packages ($1625 to $1659); mean VIR service package spending increased $494 for upper GIE packages (from $2015 to $2509) and increased $318 for lower GIE packages ($1990 to $2308); and mean ESR package spending increased $654 for upper GIE packages ($2035 to $2689) and $565 for lower GIE packages ($2199 to $2764).

Insurer spending was $175-500 less than total spending for each combination of upper or lower endoscopy entry, referral relationship type, and period. The frequency that packages had out-of-pocket spending was similar, and average out-of-pocket amounts when >$0 were not meaningfully different across referral relationship types.

GIE Service Package Utilization and Spending Variation across Referral Relationship Types after Regression adjustments

The frequency of GIE utilization after a GIE referral was similar across referral relationship types for both GIE utilization outcome measures and decreased modestly for both outcomes from 2012-2019 **Error! Reference source not found.**Figures 4.2 and 4.5). Across referral relationship types, 86-89% of referrals were linked to a subsequent GIE referral in 2012, which decreased to 80% in 2019. Across referral relationship types, a GIE package occurred within 120 days after 81-85% of referrals in 2012 and after 78-79% of referrals in 2019. Trends for GIE utilization after GIE referral were very similar after regression adjustments (Figures 4.3-4.6).

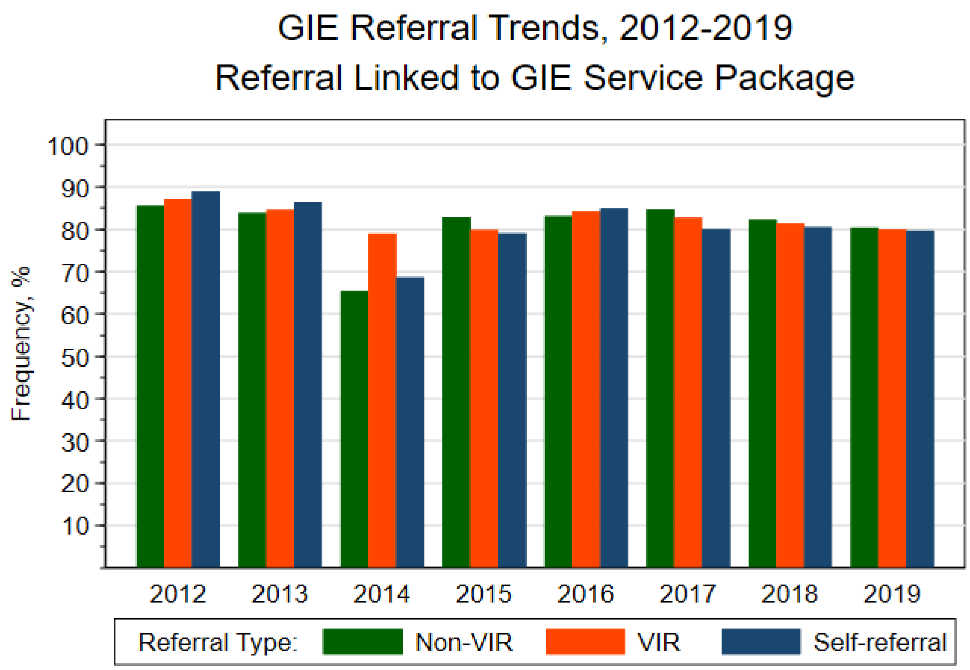

Figure 4.2 Unadjusted Frequency Trends: Whether Referral was Linked to a GIE Service Package

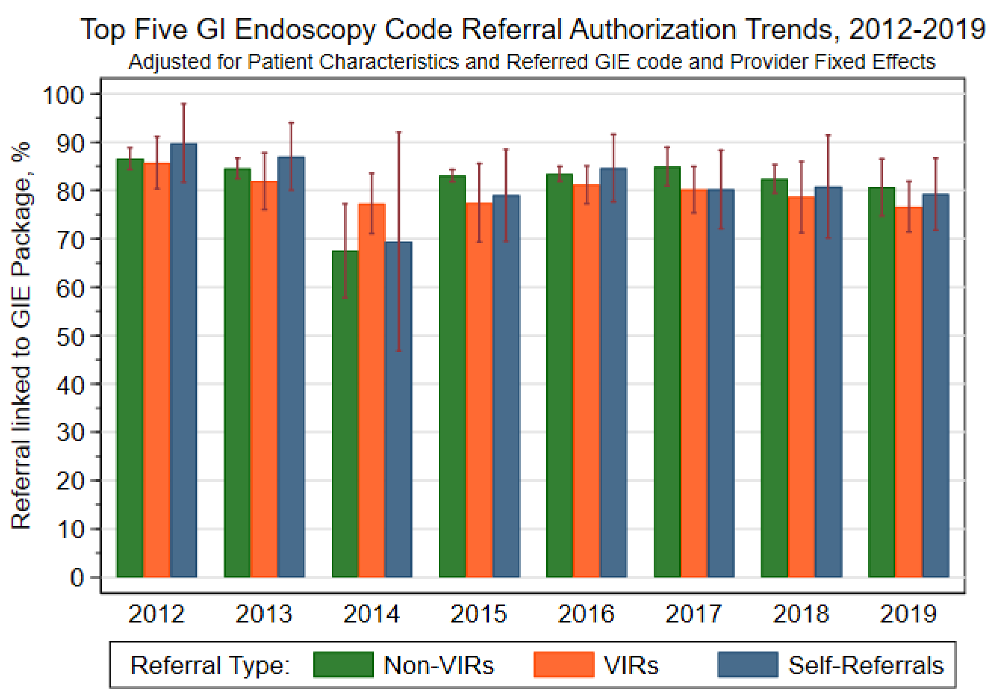

Figure 4.3 Adjusted Frequency Trends: Whether Referral was Linked to a GIE Service Package

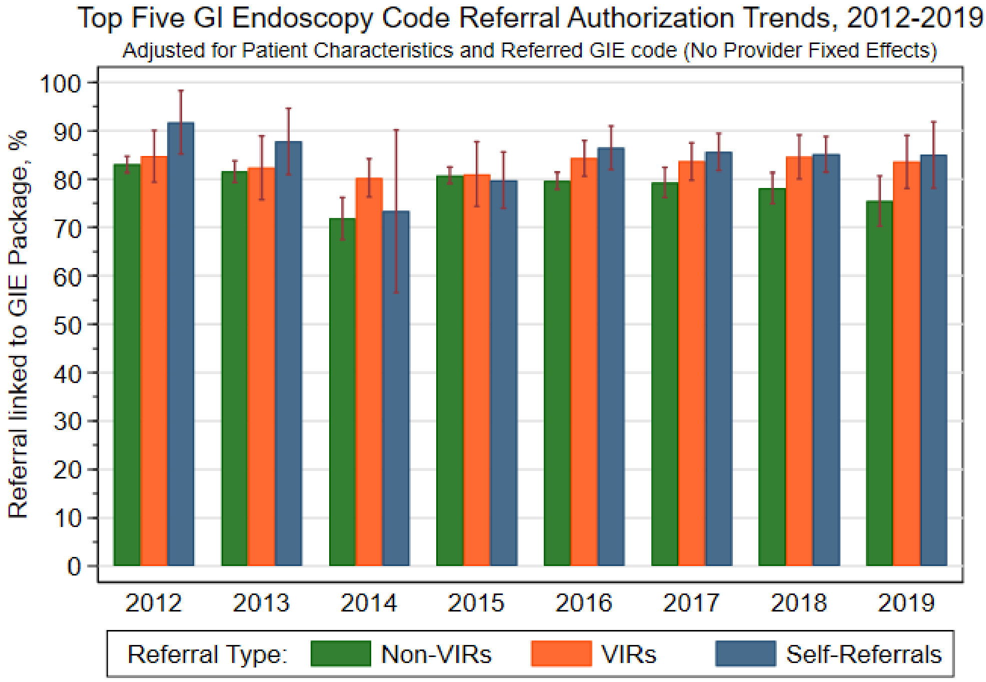

Figure 4.4 Adjusted Frequency Trends Omitting Referred Provider Fixed Effects: Whether Referral was Linked to a GI Endscopy Service Package

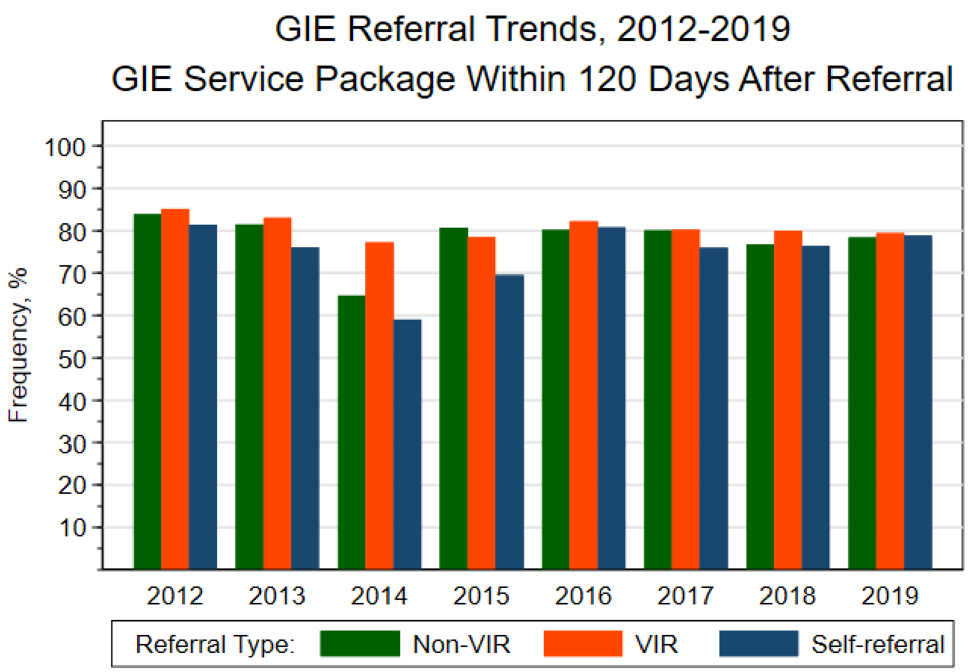

Figure 4.5 Unadjusted Frequency Trends: Whether GIE Service Package Occurred Within 120 Days After Referral

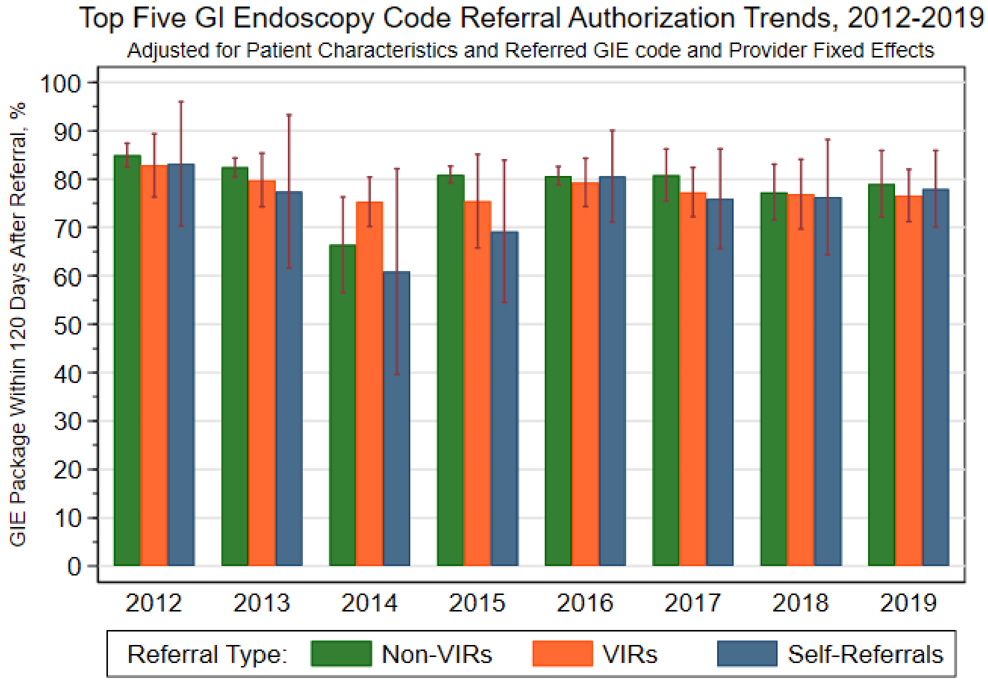

Figure 4.6 Adjusted Frequency Trends: Whether GIE Service Package Occurred Within 120 Days After Referral

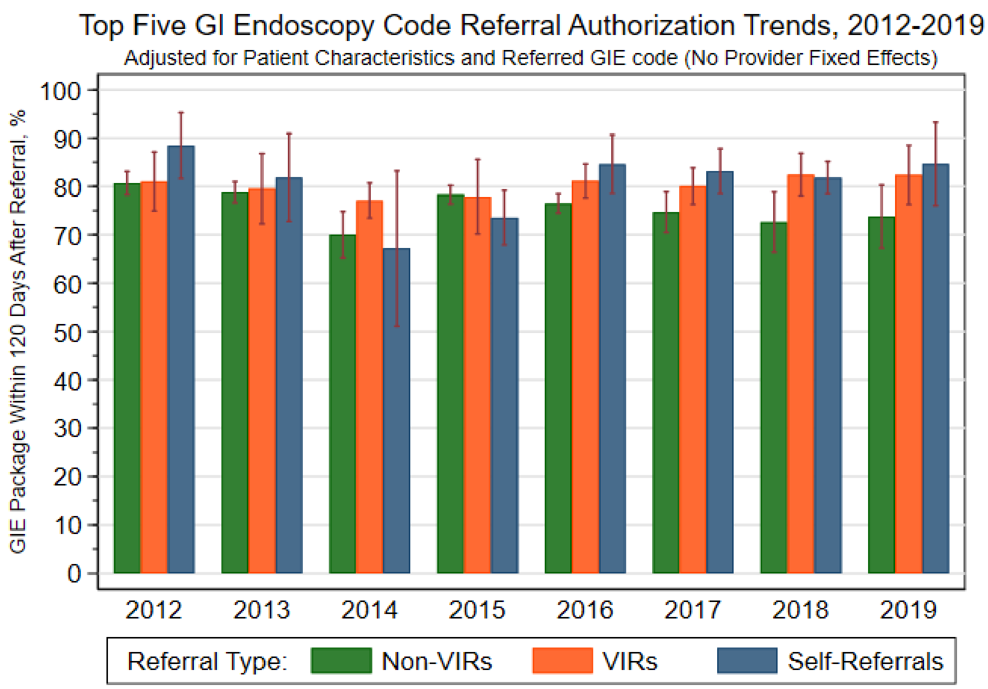

Figure 4.7 Adjusted Frequency Trends Omitting Referred Provider Fixed Effects: Whether GIE Service Package Occurred Within 120 Days After Referral

The frequency that GIE packages were delivered in HOPDs varied substantially across referral relationship types. For non-VIRs, 16% of packages were delivered in HOPDs in 2012 and 15% in 2019 and had an annual minimum of 12% and annual maximum of 21% (Figure 4.8). For VIRs, 48% of packages were delivered in HOPDs in 2012 (also, the annual minimum) and 61% in 2019 and had an annual maximum of 64%. For ESRs, 71% of packages were delivered in HOPDs in 2012 and 63% in 2019 and had an annual minimum of 49% and annual maximum of 88%. In total, 79% of ASC packages were linked to a non-VIR, and 71% of HOPD packages were linked to a VIR or ESR. The regression adjusted estimates showed similar trends although estimates for VIRs and ESRs had wide overlapping confidence intervals (Figure 4.9).

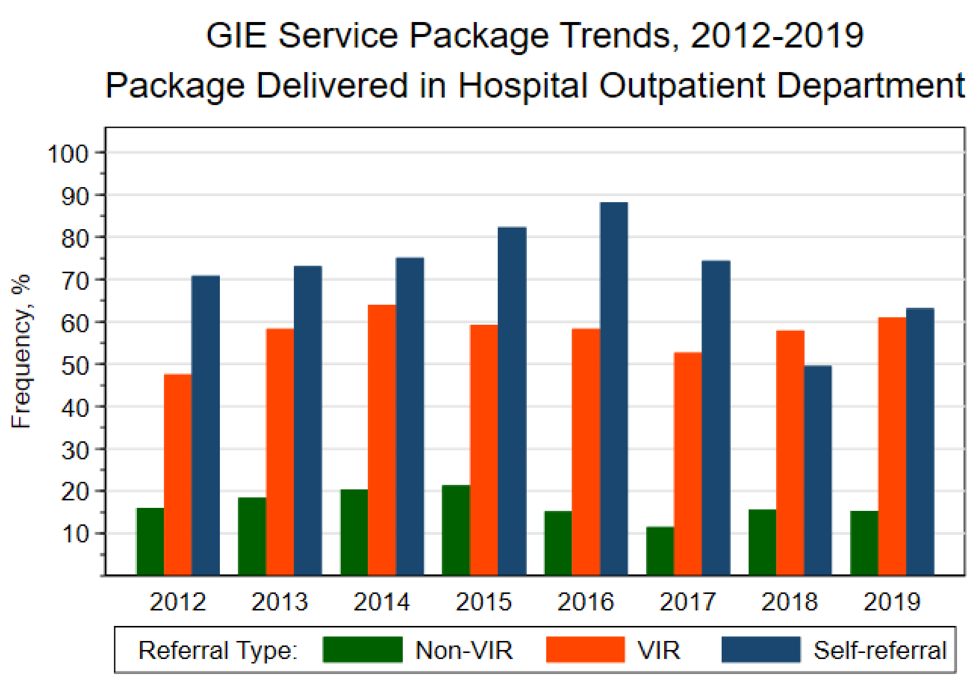

Figure 4.8 Unadjusted Frequency Trends: GIE Delivery in Hospital Outpatient Department

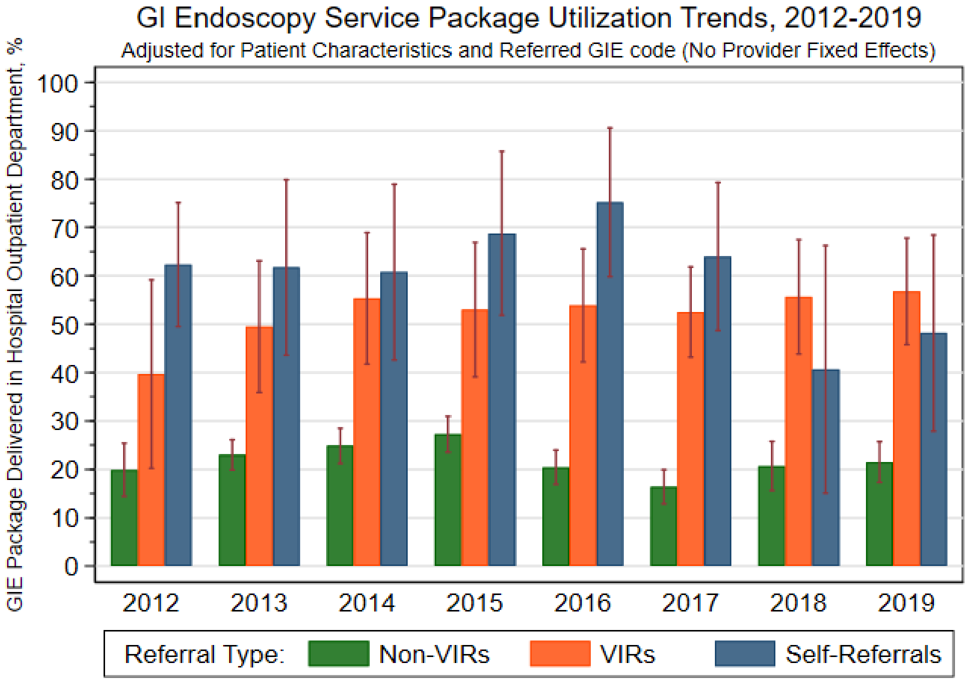

Figure 4.9 Adjusted Frequency Trends Omitting Provider Fixed Effects: GIE Delivery in Hospital Outpatient Department

The frequency that the referred GIE code was billed in the subsequent GIE service package was similar across referral relationship types and over time (Figure 4.10). From 2012-2016, the frequency was 52-53% for non-VIRs while the frequencies for VIRs and ESRS were between 42-45% most years. From 2017-2019, the frequency decreased for non-VIRs and in 2019 the three referral relationship types were all 45%. In the adjusted analyses, values were similar with overlapping confidence intervals (Figures 4.11 and 4.12).

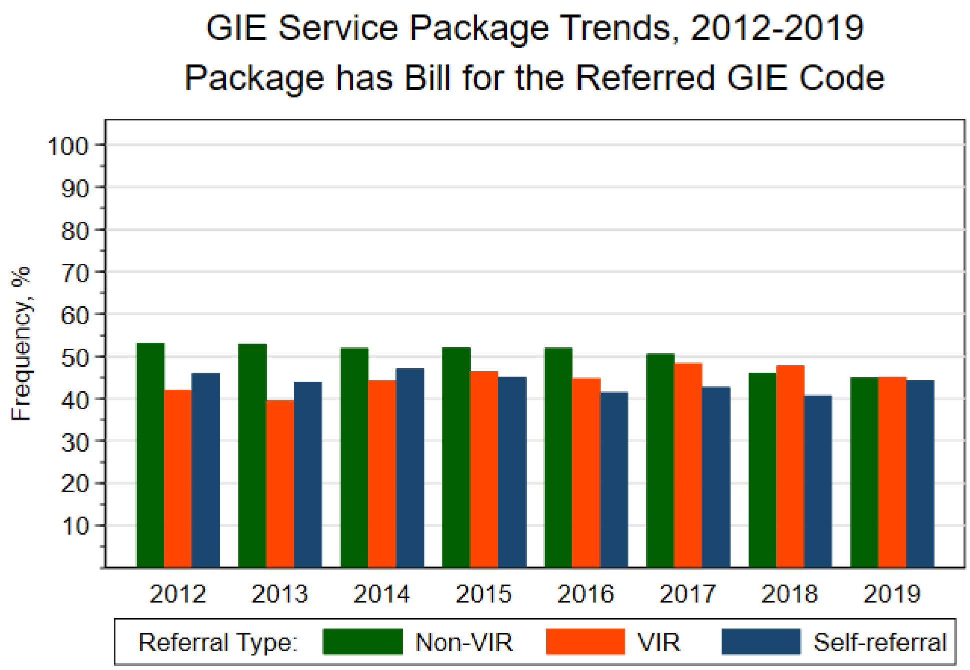

Figure 4.10 Unadjusted Frequency Trends: Whether Referred GIE Code Billed in Package

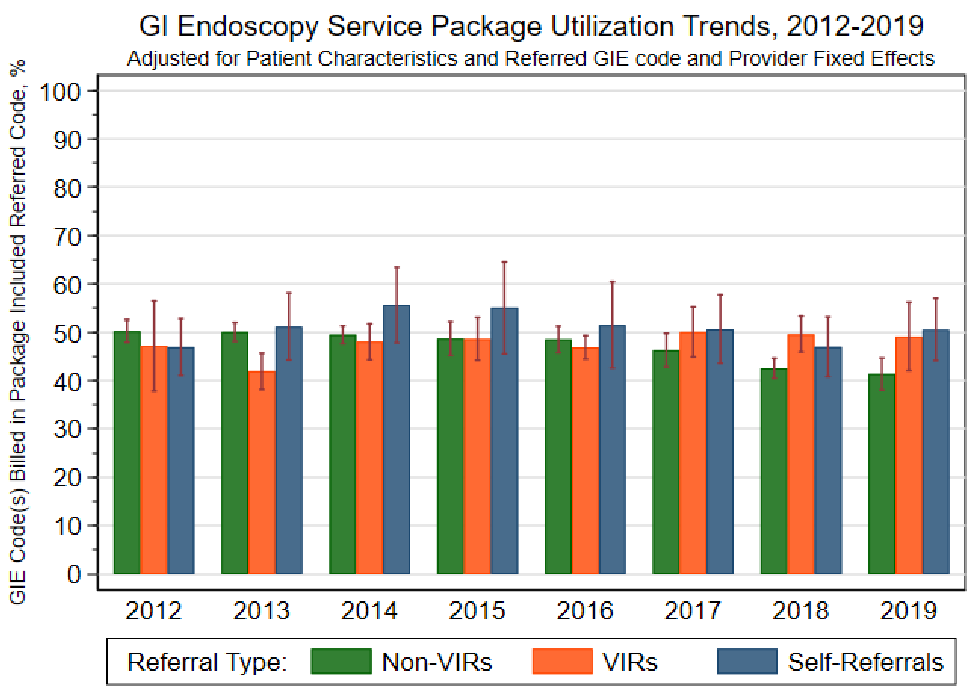

Figure 4.11 Adjusted Frequency Trends: Whether Referred GIE Code Billed in Package

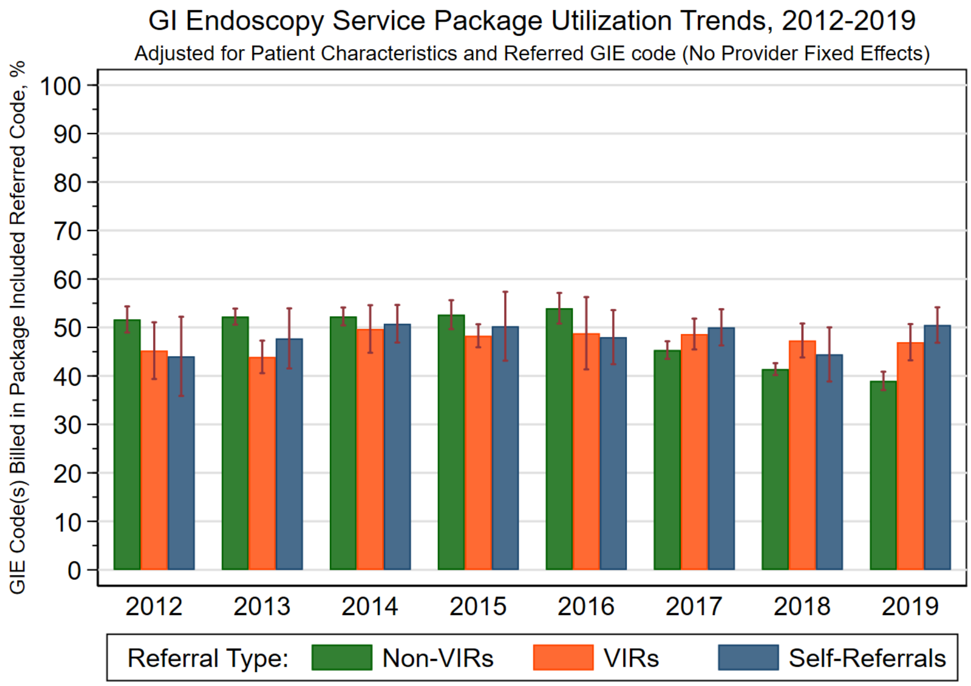

Figure 4.12 Adjusted Frequency Trends Omitting Provider Fixed Effects: Whether Referred GIE Code Billed in Package

The frequencies that multiple GIE codes were billed in a service package varied across referral relationship types (Figure 4.13). For non-VIRs, 22% of packages had multiple GIE codes billed in 2012 and 20% in 2019 (the annual minimum) and had an annual maximum of 24%. For VIRs, 23% of packages had multiple GIE codes billed in 2012 and 29% in 2019 (the annual maximum) and had an annual minimum of 19%. For ESRs, 31% of packages had multiple GIE codes billed in 2012 and 42% in 2019 (the annual maximum) and had an annual minimum of 26%. In the regression adjusted estimates, values were similar and confidence intervals usually overlapped (Figures 4.14 and 4.15).

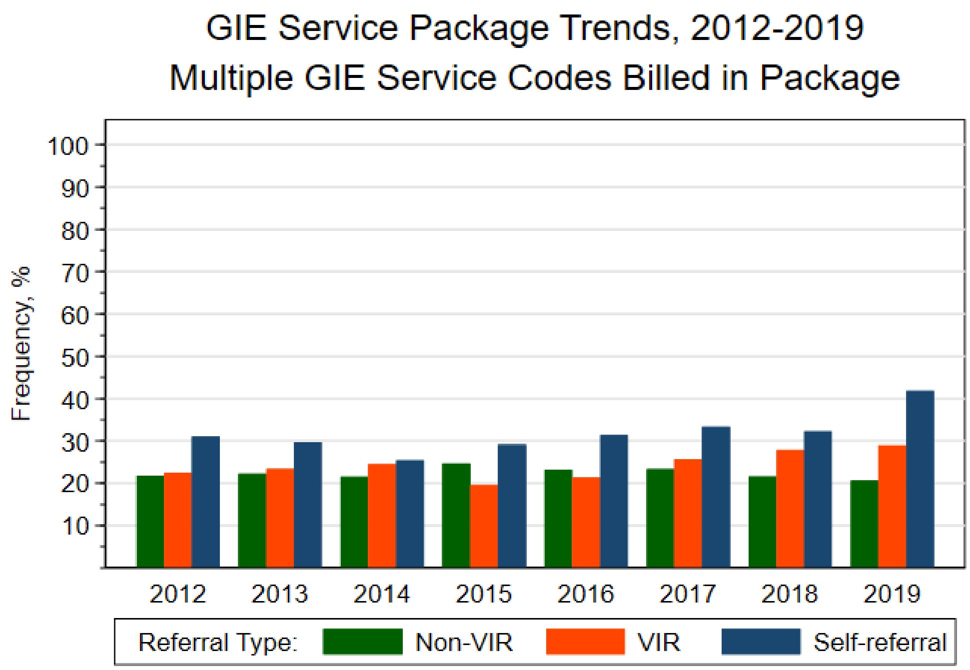

Figure 4.13 Unadjusted Frequency Trends: Whether Multiple GIE Codes Were Billed in Package

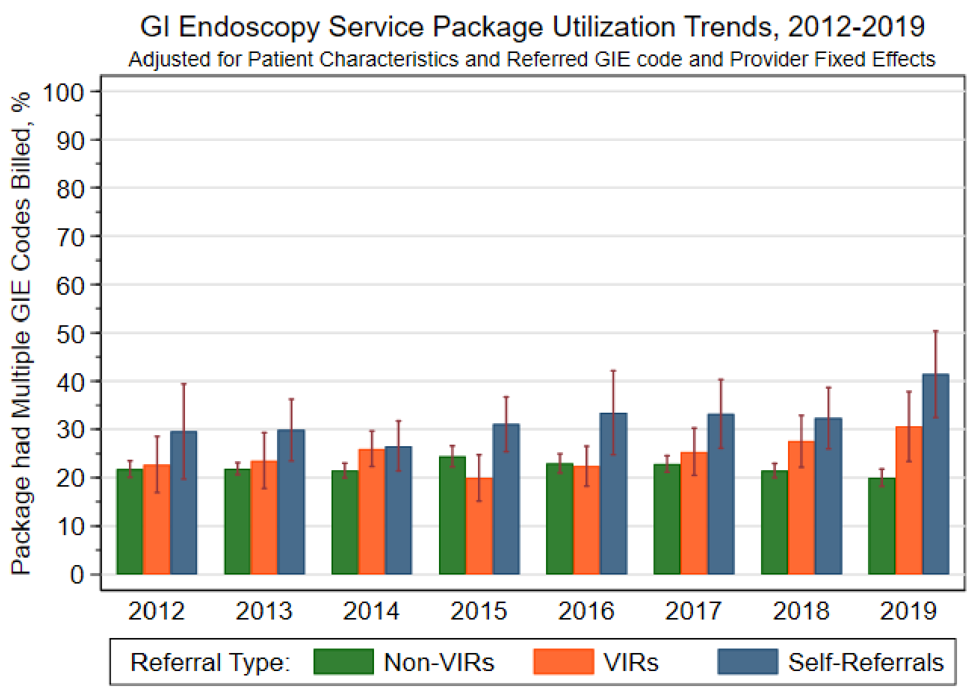

Figure 4.14 Adjusted Frequency Trends: Whether Multiple GIE Codes Were Billed in Package

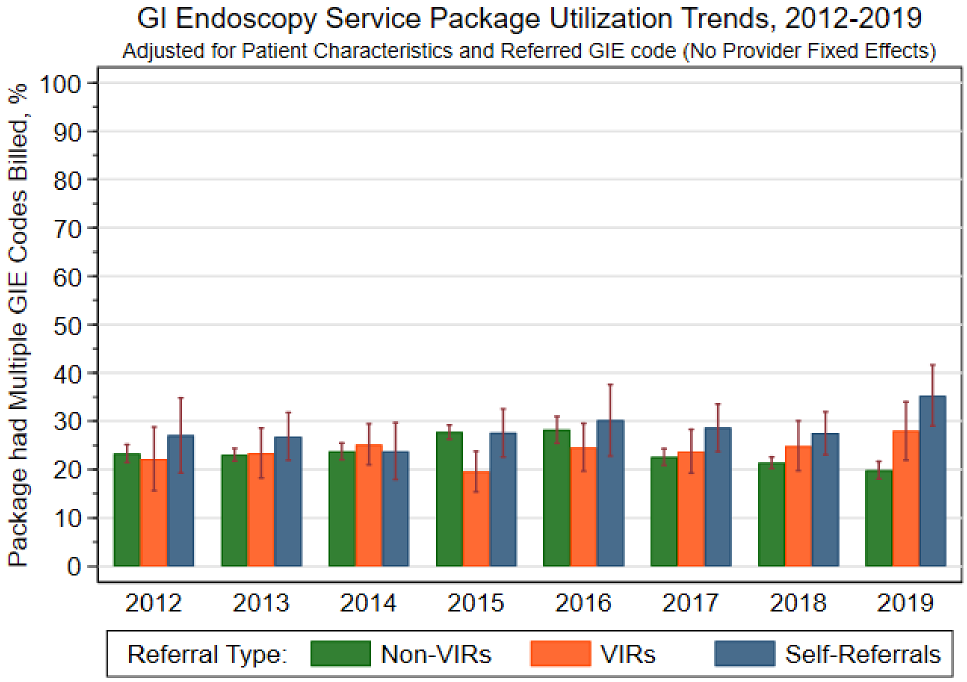

Figure 4.15 Adjusted Frequency Trends Omitting Provider Fixed Effects: Whether Multiple GIE Codes Were Billed in Package

GIE service package spending had distinct trends across referral relationship types (Figure 4.16). Non-VIR package spending only grew $174 from 2012-2019 (from $1547 to $1721). VIR package spending grew $839 (from $1771 to $2610) and ESR package spending grew $1127 (from $1916 to $3043). In the regression adjusted results, differences across relationship types are reduced to less than $500 in each year (Figure 4.17). In the regression sensitivity analysis that removed provider organization fixed effects, differences between referral relationship types were similar to the raw values (Figure 4.18).

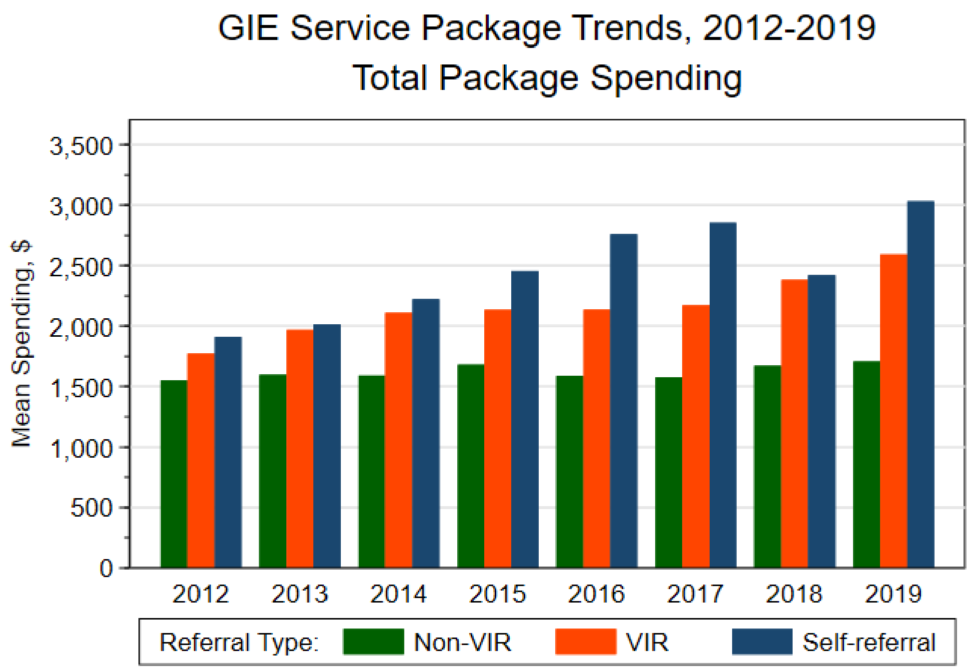

Figure 4.16 Unadjusted Total Service Package Spending Trends

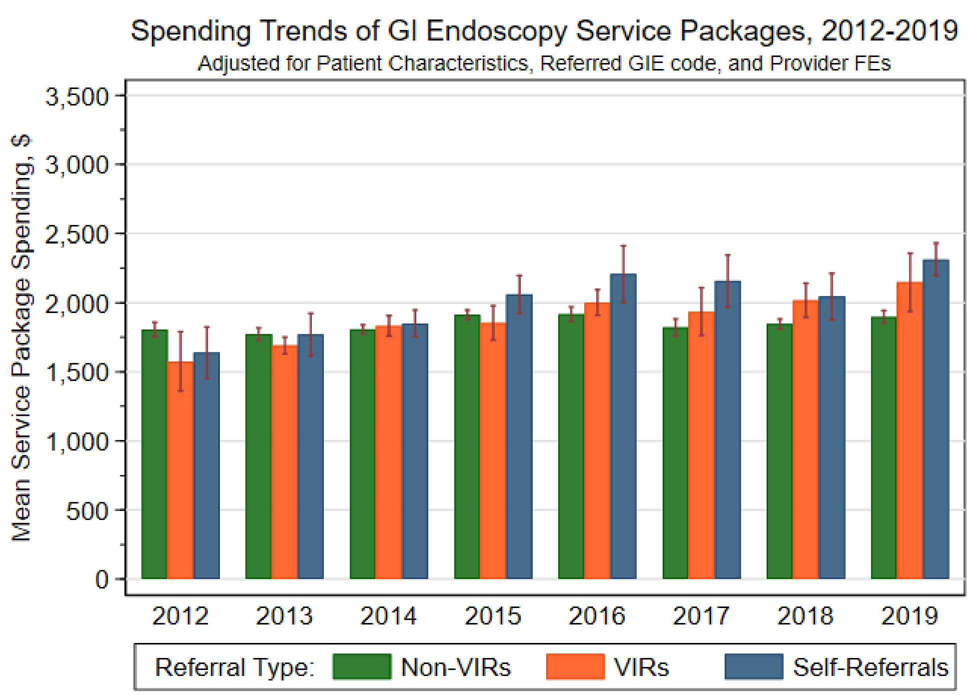

Figure 4.17 Adjusted Total Service Package Spending Trends

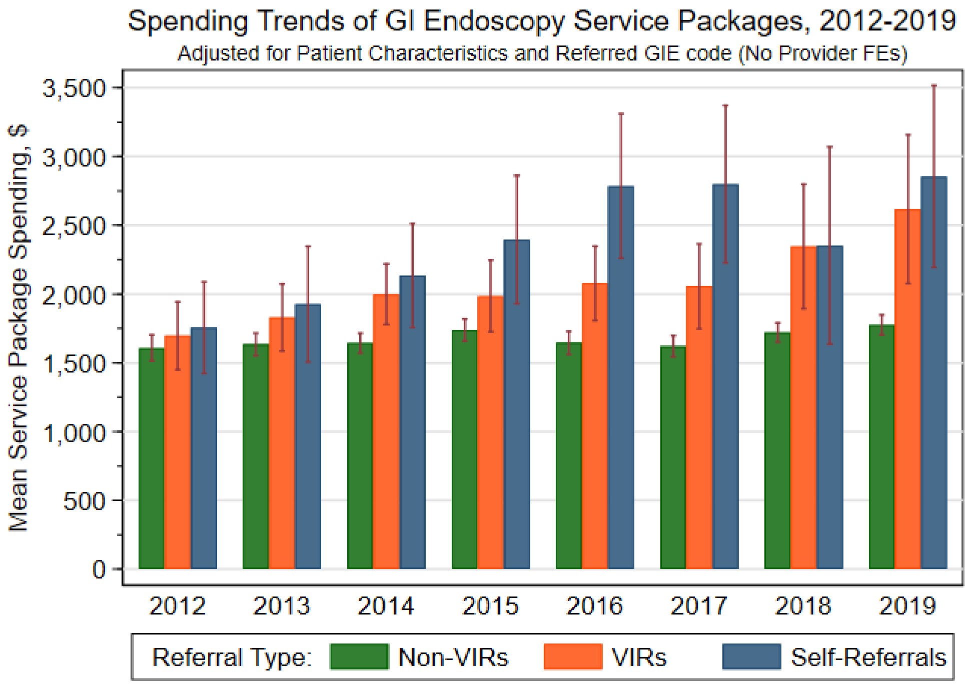

Figure 4.18 Adjusted Total Service Package Spending Trends Omitting Provider Fixed Effects

Per-capita out-of-pocket spending was similar across referral relationship types from 2012-2016 ranging between $150 and $230 (Figure 4.19). In 2017-2019, spending increased for VIRs and ESRs, and the differences in 2019 between non-VIRs ($180) and VIRs ($319) and ESRs ($332) were the largest of any year. The regression adjusted estimates, both including and omitting provider fixed effects, were similar to the raw spending amounts and trends (Figure 4.20 and 4.21).

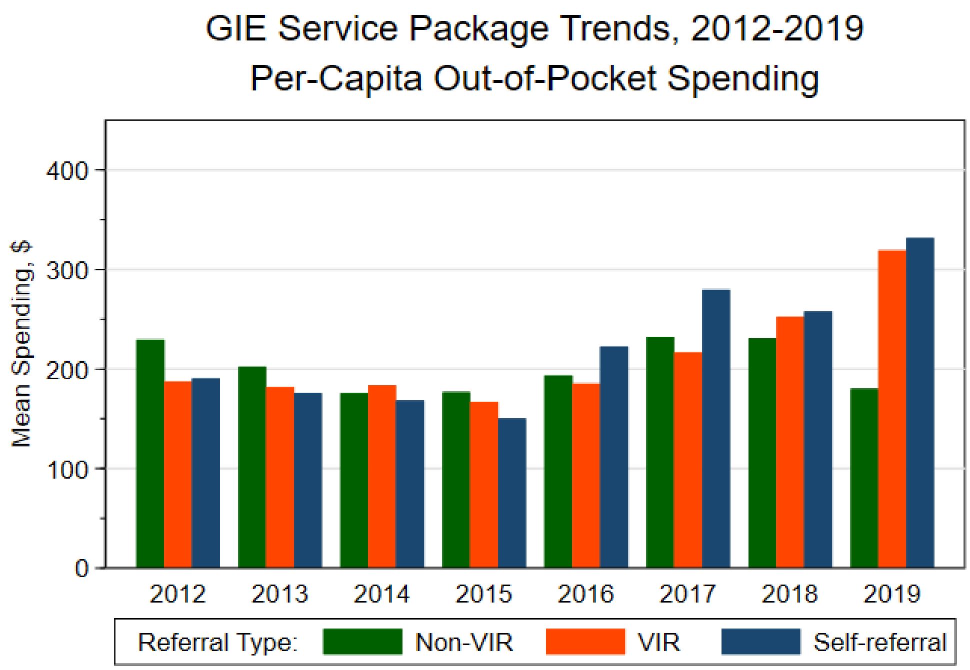

Figure 4.19 Unadjusted Service Package Out-of-Pocket Spending Trends

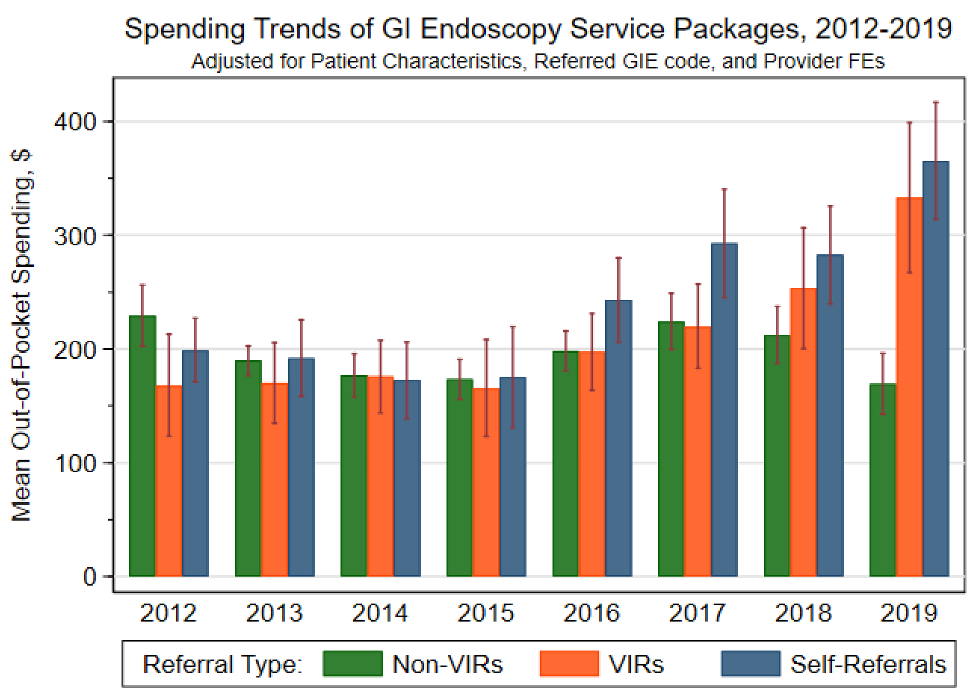

Figure 4.20 Adjusted Service Package Out-of-Pocket Spending Trends

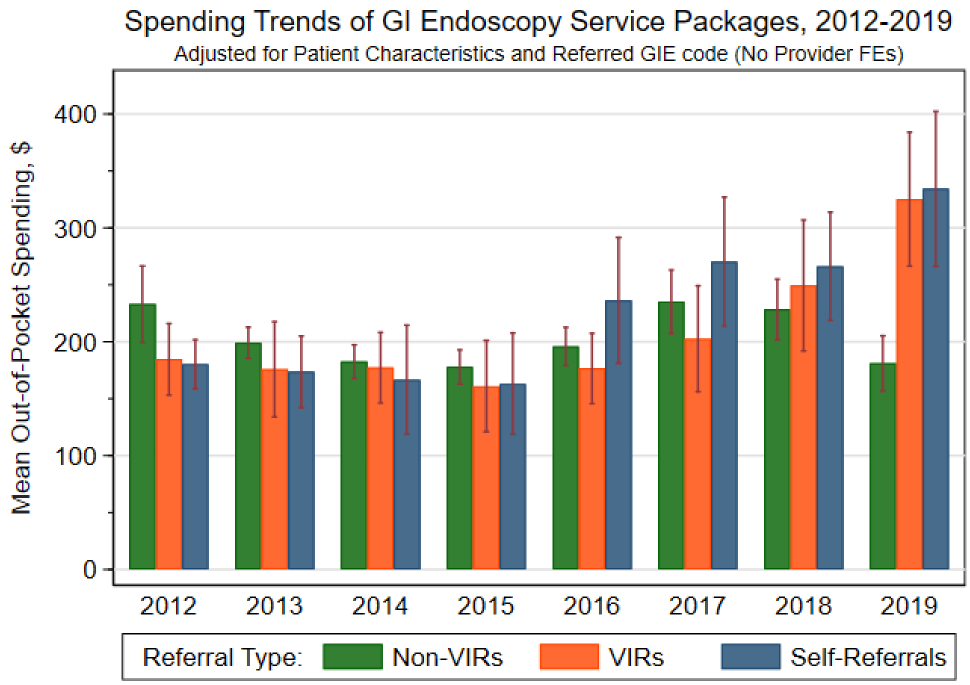

Figure 4.21 Adjusted Service Package Out-of-Pocket Spending Trends Omitting Provider Fixed Effects

4.5 Discussion

I evaluated how GIE service package utilization and spending varied depending on the relationship between the referring and referred practitioners and provider organizations for insurance enrollees who used KPWA's contracted network of GIE providers from 2012-2019. Over those years, average spending on packages following non-VIRs increased $174 while GIE service packages following VIRs and ESRs had spending increases that were greater by $665 and $953, respectively. As spending increased at different rates, the share of referrals that were non-VIRs decreased almost 10% points and over 80% of that decrease was replaced by ESRs, a 60% increase in ESRs' share of all referrals. The varied spending growth across referral relationship types happened fairly steadily from 2012-2019, although those differences were mostly muted in regression analyses after adjusting for packages' referred provider organization. Utilization did not have any steady changes that could explain the spending growth trend, so price increases predominantly drove differences in total spending growth. HOPD price increases were particularly important since 57.2% of VIR packages and 70.6% of ESR packages were delivered in HOPDs compared to 16.8% for non-VIR packages.

I considered two primary ways that utilization changes might have explained the referral relationship types' different spending trends. First, HOPD delivery of GIEs, where spending was generally much higher than ASCs, could have caused higher spending if HOPD use increased for VIRs and ESRs relative to non-VIRs. However, HOPD use for VIRs and ESRs was consistently much higher than for non-VIRs and did not have an increasing trend. Second, increasing utilization or billing intensity could have caused higher spending. GIE billing codes were usually the highest cost codes in a GIE service package and having two or more unique GIE codes in a service package usually meant GIE code spending was higher by a direct multiple of packages with a single GIE code billed. For most of 2012-2019, the frequencies of packages having multiple GIE codes billed were fairly stable within and between referral relationship types except for a substantial increase for ESRs in 2019, so increasing billing of GIE codes cannot explain total spending trends. Non-GIE ancillary codes in GIE service packages also could have affected spending trends, but spending amounts for those codes were always too small to explain total spending trends.

To reduce GIE spending in the study's population by stimulating price shopping for lower priced facilities, KPWA would have needed to facilitate more non-VIRs to ASCs to replace some of the VIRs and ESRs that preceded 71% of service packages delivered in HOPDs. However, VIRs and ESRs actually became more common compared to non-VIRs over 2012-2019. During the data's time period, Washington State mandated that insurers provide their enrollees' price estimates including personalized out-of-pocket cost information for common treatments in an internet-based transparency tool beginning January 1, 2016 (Washington State 2014). I unfortunately was not able to obtain any analyzable data on individual enrollee's tool usage, but aggregate usage reports showed that there was little uptake of the tool. Other price transparency initiatives that similarly made price estimates available without any additional intervention have generated modest or no savings (Desai, Hatfield et al. 2016, Desai, Hatfield et al. 2017, Brown 2018, Whaley 2019).

The financial incentive to price shop was generally weak as cost-sharing differences across referral relationship types were much smaller than total spending differences. Shoppable services, such as GIEs, that are scheduled in advance can be targeted for higher cost-sharing, although federal regulation generally prohibits cost-sharing for the substantial portion of GIEs that are preventive screening colonoscopies for colorectal cancer (Department of Labor, Department of Health and Human Services and Department of the Treasury 2014). Insurers may use some unconventional benefit designs for preventive services that sometimes impose cost-sharing provided enrollees have "adequate access to quality providers."(Department of Labor, Department of Health and Human Services and Department of the Treasury 2014) Reference pricing (Robinson, Brown et al. 2015, Aouad, Brown and Whaley 2019) and tiered provider networks (Ackley

2022) have generated substantial savings for GIEs, and direct financial payments to patients have been used to incentivize choosing lower-priced providers for screening colonoscopies with small effects (Whaley, Sood et al. 2021).

With differences of hundreds of dollars per GIE or perhaps even more than $1000 at stake across provider options, payers should consider more proactive interventions to increase use of lower priced providers for GIEs and other high spending services. One price transparency initiative had customer service agents telephone patients who had received an advanced imaging referral when there were provider options that were significantly lower cost, higher quality, or both (Wu, Sylwestrzak et al. 2014). In areas where the initiative was implemented compared to reference geographic areas, per-test imaging costs decreased $220 (18.7%), use of hospital-based facilities decreased 7% points, and the difference in prices between hospital-based facilities and non-hospital facilities decreased $445.

Another initiative implemented reference pricing for colonoscopy to incentivize use of lower cost ASCs rather than HOPDs (Robinson, Brown et al. 2015, Whaley and Brown 2018). The program had a $1500 reference price and patients who had an approved clinical need to use a HOPD could be exempted from the program. Patients who used an ASC were subject to standard cost-sharing (the reference price was not used, although nearly all ASCs were below the reference price) while patients who used a HOPD were responsible for the entire facility price above the reference price in addition to standard cost-sharing below the reference price. To facilitate the program and prevent patients from inadvertently using a HOPD, patients were provided a list of ASCs; providers were informed if reference pricing applied to their patient; patients were called after receiving a referral authorization and told which providers near the patient's home were subject to the reference price; and patients were automatically rescheduled to an ASC if a patient was scheduled for a colonoscopy at a HOPD with an endoscopist who also operated at an ASC (Whaley and Brown 2018). The program increased the use of ASCs from 69% to 86% in the first year of the program and to 90% in the second year while ASC use was unchanged in a control group (Robinson, Brown et al. 2015, Whaley and Brown 2018). Average spending decreased $476 (20.3%) in the first year of the program and $562 (21.0%) in the second year compared to the change between years for the control group. Reference pricing benefits have also achieved substantial savings and increased use of lower priced providers for other services (Robinson, Brown and Whaley 2017).

The impressive results of these programs demonstrate price transparency initiatives can generate substantial savings including by stimulating price competition—the ultimate objective of price transparency—when well-designed financial incentives are paired with meaningful patient engagement (Whaley and Brown 2018). Initiatives should verify and communicate that lower priced providers are of at least comparable quality as higher priced providers as some patients assume higher prices indicate higher quality (Hibbard, Greene et al. 2012).

Limitations

I note limitations in the study design and findings. First, the data comes from one regional insurer where patterns of referral relationship frequencies and spending variation may differ from other settings. In Chapter Three, I identified that 13% of packages had anesthesia assistance delivered by an independent practitioner, which varied from year to year but did not increase from 2012 to 2019. In analyses of national datasets, anesthesia assistance use increased from 38.5% to 77.7% from 2010 to 2019 (Predmore, Nie et al. 2017, Adams, Gao et al. 2022). As it is the most expensive customarily provided ancillary service in GIE service packages ($440-560 on average each year), differential rates of anesthesia assistance might be a factor in total spending differences across referral relationship types in other settings.

Second, the observational design without random assignment to referral relationships means that estimated differences between referral relationship types are subject to residual confounding despite covariate adjustment. HOPDs are preferred for higher risk patients, so higher risk patients may have been more likely to be recipients of VIRs and ESRs. I had limited clinical detail to distinguish health risk factors influencing referral relationship types. To limit case-mix differences between referral relationship types, I used novel referral authorization data to restrict the population to packages that were linked to a single preceding non-urgent referral for a GIE code and were not linked to any extraneous referrals which may correlate with more complex cases. Nonetheless, the findings are subject to residual confounding. Stratified analyses by a richer patient risk measure would better separate spending differences driven by appropriate use of VIRs and ESRs to HOPDs from excess spending attributable to low-risk patients receiving VIRs and ESRs to HOPDs who could have used a non-vertically integrated ASC.

Third, I had limited knowledge of the events that preceded ESRs and might affect GIE service package utilization and spending. Average outcomes may differ between members who were referred to a self-referring endoscopist by a vertically integrated practitioner and those who were referred by a non-vertically integrated practitioner. Patients also might have self-initiated care with a self-referring endoscopist without being referred by another practitioner. I could not definitively determine when referrals to self-referring endoscopists were VIRs, non-VIRs, or patient initiated. I explored identifying the preceding referral to a self-referring endoscopist to determine if the prior referral was vertically integrated, but only 42% of ESRs had a preceding referral to the self-referring endoscopist. Since ESRs were as common as VIRs and had higher spending than VIRs or non-VIRs, I evaluated them as their own category.

4.6 Conclusion

GIE service package spending greatly increased for VIRs and ESRs from 2012-2019 compared to modest growth for non-VIRs. The increases appear to be predominantly driven by price increases for the providers and HOPD facilities that more frequently delivered VIR and ESR packages. Changes in utilization were not sufficient to explain spending trends. When service price variation across providers amounts to several hundreds of dollars or more per case, payers should follow the examples of successful interventions to stimulate use of lower priced providers that went further than making prices transparent by implementing stronger incentives for price shopping and assisting enrollees with selecting providers.

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Chapter 5. Conclusion

5.1 Summary

This dissertation investigated contextual factors that influence the effectiveness of all-inclusive service price transparency, which is meant to enable price shopping for GIEs and other services that have ancillary service or item codes billed in addition to a primary service code. Considering this dissertation's findings, all-inclusive service price transparency has significant implementation challenges for GIEs, is not clearly more informative for price shopping than simpler primary service code price transparency and has the potential to produce misleading information about price differences between providers. To better address unjustified high prices of GIEs and other complex services, legislators could enact new statutory authority to enable regulators to improve all-inclusive service price transparency; payers and legislators could pursue stronger incentives to stimulate price shopping; and/or legislators could regulate prices to address the large price differences between HOPDs and ASCs for some billing codes and the service referrals that steer patients to HOPDs.

In Chapter two, I evaluated the feasibility of forecasting all-inclusive GIE service package spending subject to clinical uncertainty, conditional on the patient's GIE referral code. The effectiveness of all-inclusive service package price transparency at facilitating price shopping depends on how well all-inclusive price estimates forecast actual service package spending. Less accurate estimates reduce shoppers' ability to identify higher value, lower priced providers. I examined GIE referral authorizations and service packages received by KPWA enrollees and evaluated differences between expected and actual utilization and spending using GIE referral codes as an indicator of expected service need. I found that two-thirds of GIE packages were not billed as referred - meaning the referred GIE code was billed and no other GIE code was billed. For two of the five most common GIE codes, spending estimates of packages billed as referred were $800 and $959 less than average spending of actual packages delivered after a GIE code referral subject to clinical uncertainty. In regression-adjusted spending forecasts, most models that adjusted for variables known prior to service delivery had large errors. For the primary model, forecasted spending had a +/- $574 mean error. After adjusting for the GIE and ancillary codes billed in a package, i.e., controlling for clinical uncertainty which is not generally possible prior to service delivery, the average error was +/- $299. These findings suggest that forecasting all-inclusive service spending is difficult and may not be an improvement compared to simpler primary service code price transparency.

In Chapter three, I investigated the contributions of ancillary service spending and IBEs to GIE packages delivered in HOPDs and ASCs. Incomplete estimates of service package spending that omit ancillary services or IBE spending could distort provider comparisons across HOPDs and between HOPDs and generally lower cost ASCs, which are not subject to the federal hospital price transparency mandate. I appraised changes in ancillary, IBE, and total spending for HOPDs and ASCs from 2012-2019. Average total HOPD spending increased $1,007 more than total ASC spending while ancillary services and IBE spending remained small portions of total spending for packages delivered in either setting over the entire time period. Combined ancillary services and IBE spending was not large enough that omitting them would make HOPDs appear price competitive with ASCs. These findings suggest that greater savings are possible from moving GIEs from HOPDs to ASCs than from correcting the omissions in HOPD service package price estimates.

In Chapter four, I evaluated how GIE utilization and spending varied depending on the relationship between the referring and referred practitioners and provider organizations of a GIE referral. VIRs and ESRs may inhibit price shopping and increase providers' bargaining power that enables them to negotiate high prices. I compared how regression adjusted and unadjusted utilization and spending outcomes varied from 2012-2019 across VIRs, ESRs, and non-VIRs. Over the entire time period, mean GIE service package spending increased from $1547 to $1721 for packages linked to a non-VIR, from $1771 to $2610 for packages linked to VIRs, and from $1916 to $3043 for packages linked to ESRs. For most utilization outcomes, differences across referral relationship types were small. The exception was package delivery in HOPD, which fluctuated in frequency for VIRs and ESRs, but was at least twice as frequent and sometimes more than three times as frequent than for non-VIRs. Regression adjustment for observed covariates usually did not change the appearance of results substantially. The exception was adjusting total spending for provider fixed effects, which greatly reduced differences between the referral relationship types. This finding suggests that the higher spending of VIR and ESR packages is explained by which providers are more often parties in VIRs and ESRs rather than individual effects of each referral relationship type.

5.2 Practice and Policy Implications

In total, these findings suggest that all-inclusive service price transparency as currently implemented is unlikely to help reduce prices of complex services. To truly make the hospital price transparency mandate's service package price disclosures informative about all-inclusive service spending, CMS would need new statutory authority. Currently, CMS does not have statutory authority to compel hospitals to report the contributions of IBEs to service packages, so service package estimates are underestimated unless hospitals can voluntarily provide IBE spending information. In our data, ancillary services spending and IBE spending mostly overlapped. If hospitals were required to include IBE spending in service package price estimates, CMS could modify guidance for generating service package price estimates to instruct hospitals to report prices for a standardized scenario or set of common scenarios including a primary service code and an exact set of ancillary codes, which would be directly comparable across hospitals. Because GIEs and other complex services are subject to clinical uncertainty, CMS could instruct hospitals to report price ranges for service packages that include most cases. To better communicate clinical uncertainty, CMS could also instruct hospitals to report the frequencies that customarily provided ancillary codes are included in a package with their prices to allow shoppers to compare treatment intensity across hospitals.

These modifications to service package price transparency would more completely convey the nature of service package spending, which would help shoppers understand how service package spending varies for individual providers. Going beyond correcting the missing IBE spending in service package price transparency as currently implemented, additional statutory authority could enable CMS to more substantially improve service package price transparency. New statutory authority could require providers to report claims and selected medical records data to an all-payer claims database to enable CMS or a designated central authority to generate price transparency estimates with a uniform methodology and risk adjust estimates using patient risk scores and outcomes generated from claims and medical records data

In the best market outcome for all-inclusive service price transparency, price estimate disclosures would be comparable across providers and would explain typical treatment intensity and the uncertainty of service package spending for each provider. Price disclosures would be paired with provider quality assessments or would explain when quality is similar across providers. The information value of the disclosures would stimulate substantial use, and shoppers would select the provider who offers the best value for their level of service need. Since quality is comparable across many providers for many shoppable services, lower priced providers with less intensive treatment patterns, which would generally be freestanding non-HOPD facilities, would frequently offer the best value for lower risk patients and would gain market share. To retain market share, providers would reduce prices and both price shoppers and non-shoppers would benefit from lower prices.

The most optimized all-inclusive service price transparency may not achieve the best market outcome without addressing the structural forces that cause higher spending. From 2012-2019 in our data, GIE spending increased substantially more for packages delivered in HOPDs than in ASCs. Because the share of GIE referrals that were VIRs and

ESRs increased, the share of packages delivered in HOPDs also increased. In total, 71% of GIEs delivered in HOPDs were preceded by a VIR or ESR, so increasing use of lower priced ASCs requires reducing the numbers of VIRs and ESRs

To address high spending in HOPDs fueled by VIRs and ESRs, stakeholders can either increase financial incentives to price shop or regulate prices. Payers might increase financial incentives to use lower priced providers by implementing targeted benefits designs such as reference pricing (Robinson, Brown et al. 2015, Robinson, Brown and Whaley 2017, Gruber 2021) and tiered provider networks (Sinaiko, Landrum and Chernew 2017, Prager 2020, Ackley 2022, Ackley 2025). Although these benefits have generated substantial savings, they have not been adopted by many employers because of concerns about their complexity and potential to generate catastrophic out-of-pocket costs (Sinaiko, Alidina and Mehrotra 2019, Scanlon 2020). Considering these benefits have not been adopted widely, the federal government or state governments that would like to stimulate price shopping might consider regulations or incentives to encourage their adoption.

Rather than try to stimulate more cost-sensitive demand, price regulation could reduce or eliminate excessive HOPD prices by limiting site-of-care payment differentials. In 2015, the federal government enacted site-neutral payment policies for Medicare for some services that can safely be delivered in non-hospital facilities, although the policy exempted HOPDs on hospital campuses and 80% of off campus HOPDs (Whaley, Post and Perkins 2024, Post, Thai et al. 2025). Increasing site-neutral payments for Medicare has bipartisan support (Azar and Sebelius 2024, Lou, Linehan et al. 2025). For commercial insurance, site neutral payment proposals typically entail a price cap as a percentage of

Medicare payments, which could generate savings of as much as tens of billions of dollars per year (Sen, Singh and Anderson 2022, Parente 2024, Murray, Janjua and Whaley 2025). Proposed site-neutral payment price caps could eliminate most of the difference between HOPDs and ASCs for GIEs that occurred in our data.

Considering the limited effectiveness of price transparency and limited uptake of targeted benefit designs despite some impressive results, substantial progress toward constraining excessive price variation may be likely to come only from legislative action. That legislation conceivably could directly limit prices, support payers in stimulating insurance enrollees to be more price conscious, or some combination.

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