Evidence Impact Labs

HEALTH POLICY CONSULTING

Utilization Management and Provider Payment Practices of Medicare Advantage Plans

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ACRONYM GLOSSARY

CMS	Centers for Medicare and Medicaid Services
CT APCD	Connecticut All-Payer Claims Database
IDR	Integrated Data Repository
MedPAC	Medicare Payment Advisory Commission
ANOVA	Analysis of Variance

GLOSSARY

Copayments - A specified dollar amount, typically modest, that insured individuals must pay for a particular unit of service, such as an office visit, emergency room visit, prescription filling.

Deductible - The amounts paid by enrollees or a third party for covered services before Medicare or Medicaid provides reimbursements.

Inpatient Hospital Services - Items and services provided to an inpatient of a hospital, including room and board, nursing and related services, diagnostic and therapeutic services, and medical or surgical services.

Medicaid - The joint federal/state entitlement program, enacted in 1965 as Title XIX of the Social Security Act, that pays for medical care on behalf of certain low-income groups.

Medicare - The federal health insurance program for people age 65 or older, certain younger individuals with disabilities, and those with End Stage Renal Disease.

Medicare Advantage - Health plans offered by private companies approved by Medicare to provide healthcare coverage at a uniform premium and cost-sharing level for all Medicare beneficiaries residing in the service area (or a segment of the service area).

Medicare Part A or Hospital Insurance - An insurance program that provides basic protection against the costs of hospital and related post-hospital services for Medicare enrollees. It helps cover inpatient hospital care, skilled nursing facility care, hospice care, and certain home health services.

Medicare Part B - A voluntary insurance program that provides benefits for physician services, outpatient care, ambulatory services, medical supplies and services, durable medical equipment, certain home health care services, and preventive services.

Medicare Part D - Prescription drug coverage for Medicare beneficiaries who choose to participate. This coverage is provided through Prescription Drug Plans (PDPs) or Medicare Advantage.

Outpatient Hospital Services - Services provided to outpatients by a participating hospital for the diagnosis or treatment of an illness or injury. Outpatient hospital care may include emergency department services, observation services, outpatient surgery, lab tests, and X-rays.

Outpatient Services - Medical and other services provided by a hospital or another qualified facility or supplier, such as community mental health center, rural health clinic, mobile X-ray

unit, or freestanding dialysis unit. These services include outpatient physical therapy, diagnostic X-ray and laboratory tests, as well as X-ray and other radiation therapies.

Physician Services - Under Medicare, physicians services are those provided by individuals licensed under state law to practice medicine or osteopathy. Services covered under hospital bills are not included.

Program Payments - The total amount Medicare paid for covered healthcare services, as compiled from fully-adjudicated claims data recorded in CMS' system-of-record databases.

Supplier - A physician or other practitioner, or an entity other than a provider, that provides health care services under Medicare.

Total Days of Care - Any day on which inpatient hospital services were provided to a person eligible for Medicare Part A benefits, including both covered and non-covered days of care.

Utilization - A measure of the extent to which the members of a covered group use a program or obtain a particular service, or category of procedures, over a given period of time.

ANOVA - A statistical method used to compare the means of three or more groups to determine if there are statistically significant differences among them. It assesses the impact of one or more independent variables (factors) on a dependent variable by analyzing the variation within groups compared to the variation between groups

EXECUTIVE SUMMARY

This analysis explores the differences in utilization patterns, costs, and utilization management practices between Medicare Advantage, Traditional Medicare and Medicaid plans from 2021to 2023. The findings reveal trends in payments, service utilization, prior authorizations, denials and requiring referrals for healthcare services by payer.

Medicare Advantage plans consistently paid a higher proportion of the total charges compared to Medicaid across most services, reflecting a greater reimbursement rate relative to billed amounts. However, Medicaid often incurred higher absolute costs for specific services, such as inpatient stays and imaging, despite reimbursing a smaller percentage of the total charges. Similarly, for prescription medicines, Medicare Advantage paid a higher proportion of charges and, on average, more per prescription than Medicaid, though Medicaid exhibited greater variability in charges and payments over time. For example, based on billed charges, Medicare pays a higher proportion of billed charges. So, if a hospital charges $1,000, Medicare may pay $700, and Medicaid might pay $600.

Utilization rates varied significantly between payers. Medicare Advantage beneficiaries had higher utilization rates for services like physical therapy and emergency department visits, while Medicaid beneficiaries demonstrated significantly greater use of home health care. Medicaid beneficiaries also experienced longer durations of care for hospice, home health, and non-acute inpatient stays compared to Medicare Advantage enrollees, though durations for acute inpatient stays were comparable across the two payers. In terms of pharmacy usage, Medicaid beneficiaries averaged more prescriptions annually than Medicare Advantage enrollees, with both programs maintaining a high proportion of generic prescriptions.

Medicare Advantage plans employed varying utilization management strategies across service types. Prior authorization requirements were particularly high for hospice and home health care, with increases observed in emergency department visits and telehealth services over time. Referral requirements were most frequent for hospice, dialysis, and prescription medicines, with growing trends for home health and inpatient stays. Additionally, claim denial rates rose for hospice, inpatient stays, and outpatient consultations.

Our analysis of the predictors of utilization management approaches concluded that average charge amount, insurer, amount paid, and provider type were associated with prior authorization requirements. For referrals, provider type and average number of visits remained consistent predictors, while charge amount and paid amount showed variability across payers. Similarly, claim denials were significantly influenced by provider type and average number of visits, though average charge amount and paid amount varied as a predictor.

Cigna and Anthem had a strong association between prior authorizations with charge and paid amount, while charge and paid amounts had minimal impact on prior authorizations by United Healthcare and Harvard Pilgrim Health Care. Charge and paid amount were also significant for referrals for Cigna, Anthem, and United Healthcare, but not for Aetna and Connecticare. For claim denials, Anthem and Connecticare are associated with average charge amounts, while Cigna, United Healthcare, and Tufts Health Plan show stronger associations with paid amounts.

KEY FINDINGS

Medical and Pharmacy Costs: Medicare Advantage consistently pays a higher proportion of medical and pharmacy charges compared to Medicaid. Medicaid pays more in absolute medical cost, with greater variability in Medicaid charges and payments for prescription medicines over time.

Medical and Pharmacy Utilization: Medicare Advantage beneficiaries have higher utilization rates for physical therapy and emergency department visits, while Medicaid beneficiaries show significantly higher utilization of home health care. Medicaid beneficiaries experience longer durations for hospice, home health, and non-acute inpatient stays, whereas durations for acute inpatient care are comparable across payers. Medicaid beneficiaries average more annual prescriptions than Medicare Advantage enrollees. Both programs consistently maintain high use of generic prescriptions.

Medicare Advantage Utilization Management: Prior authorization by Medicare Advantage plans are most frequently required for hospice, dialysis, telehealth, imaging, and inpatient services (acute and non-acute). Prior authorizations for outpatient consultations and physical therapy are less consistent. Referrals are most consistently required for emergency department visits, medical equipment, imaging, oncology, physical therapy, and inpatient non-acute care. Denials are most frequent for emergency departments, chiropractic care, home health, imaging, hospice, and inpatient care (acute and non-acute). In contrast, telehealth and prescription medicines experience lower denial rates.

Predictors of Utilization Management: Prior authorization, referrals and denials are consistently predicted by provider type and average number of visits across payers. Financial predictors including average charge and paid amounts vary significantly as a predictor. There is a strong association between prior authorizations and the charge and paid amount for Cigna and Anthem, while they have minimal impact on prior authorizations by United Healthcare and Harvard Pilgrim Health Care. Results are also significant for referrals and charge and paid amount for Cigna, Anthem, and United Healthcare, but not for Aetna and Connecticare. For claim denials, Anthem and Connecticare are associated with average charge amounts, while Cigna, United Healthcare, and Tufts Health Plan show stronger associations with paid amounts.

BACKGROUND

Healthcare coverage for individuals aged 65 and older in the United States is facilitated through federal and private insurance programs, with Traditional Medicare and Medicare Advantage (Part C) as the primary options. Traditional Medicare, established in 1965, is a federally funded program offering hospital coverage (Part A) and outpatient and medical coverage (Part B) on a fee-for-service basis. Beneficiaries can also opt for supplemental drug plans (Part D) and Medigap policies to manage out-of-pocket expenses (Centers for Medicare & Medicaid Services, 2018, 2024). In contrast, Medicare Advantage enables beneficiaries to enroll in privately

managed plans that bundle Parts A, B, and often D, while offering additional benefits such as vision, dental, and wellness services (Agarwal et al., 2021). By 2023, Medicare Advantage enrollment exceeded 28 million nationally, accounting for nearly half of all Medicare beneficiaries (Ramsay et al., 2024; Landon et al., 2023).

Individuals aged 65 and older who are eligible for Medicare can also enroll in Medicaid if they meet their state's income and asset requirements. These individuals, known as dual-eligible beneficiaries, benefit from both programs, with Medicaid covering costs that Medicare does not, such as premiums, deductibles, copayments, and long-term care services. The level of Medicaid assistance varies based on income, with full or partial coverage available depending on individual circumstances.

Traditional Medicare and Connecticut Medicaid reimburses providers on a fee-for-service basis, whereas Medicare Advantage employs capitated payments that incentivize cost control through managed care techniques such as narrow networks and prior authorization (Centers for Medicare & Medicaid Services, 2024; Agarwal et al., 2021). While these measures are designed to reduce unnecessary spending, they can also create potential barriers to care, including treatment delays and challenges in accessing high-quality providers (American Hospital Association, 2024; Shah & Jacobson, 2024). These contrasting approaches make it essential to evaluate how insurance type may impact healthcare access and spending.

In Connecticut, where nearly one in five residents is aged 65 or older, addressing the financial and quality implications of insurance practices is a critical priority. While there is growing interest in cost-control measures to curb rising healthcare expenditures—statewide spending increased by 3.4% in 2022, surpassing the 3.2% cost growth benchmark (Connecticut Office of Health Strategy, 2022)—there are significant questions about the effectiveness and fairness of utilization management practices as a means of achieving these goals. Medicare Advantage plans, which frequently employ strategies such as prior authorizations, may rely on these practices more heavily than Traditional Medicare or Medicaid. This raises concerns about whether such practices lead to poorer outcomes and diminished quality of care for Medicare

Advantage enrollees, particularly among vulnerable populations. A 2023 survey reported that 95% of physicians experienced delays in patient care due to prior authorization requirements, and 78% observed patients discontinuing treatment as a result (American Hospital Association, 2024). These findings underscore the need to critically examine whether utilization management practices are appropriate tools for cost control and how their application might disproportionately affect patients covered under Medicare Advantage plans.

This study seeks to address these issues by analyzing utilization and provider payment practices across insurance types for individuals aged 65 and older in Connecticut. Leveraging CMS Integrated Data Repository and the Connecticut All Payer Claims Database from 2021 to 2023, the study will compare healthcare utilization patterns and costs by insurance type and provider type. Furthermore, it will explore the factors influencing differences in utilization and payment practices, including prior authorization, denials and referral requirements with a focus on identifying disparities that could inform policy and practice. The findings from this study will provide critical insights into how different insurance plans may impact healthcare access, quality, and cost for Connecticut's aging population.

METHODOLOGY

This study is a retrospective observational study to analyze healthcare utilization and provider payment practices among individuals enrolled in Medicare Advantage plans, Traditional Medicare, and Medicaid in Connecticut. The primary focus is comparing utilization patterns and payment practices across these insurance types between January 1, 2021, and December 31, 2023. Inclusion criteria include Connecticut residents over the age of 65 enrolled in qualifying insurance plans. Excluded from the analysis are uninsured individuals, non-residents of Connecticut, and individuals with commercial insurance that is not a Medicare Advantage plan, ensuring the study focuses on populations most relevant to Medicare-related insurance policies.

Key variables of interest include insurance type, service, provider payments, utilization, claims denials, referral required, and prior authorizations. Outcomes such as utilization, provider payments, and frequency of utilization management practices will be analyzed to identify patterns and disparities in coverage.

Descriptive statistics will be used to calculate the average frequency of utilization, cost of utilization, and services. Analysis of Variance (ANOVA) will be used to evaluate how multiple independent variables contribute to the variation in a dependent variable. ANOVA enables researchers to identify which predictors have meaningful associations with the dependent variable and the magnitude of their contributions. Please refer to Appendix A1 for the statistical analysis plan.

Data for this study comes from two primary sources. The CMS Integrated Data Repository provides aggregate-level data on Traditional Medicare patients, including enrollment patterns and healthcare utilization. Complementing this, the Connecticut All-Payer Claims Database (CT APCD) supplies detailed claims-level data for Medicare Advantage and Medicaid enrollees, capturing utilization, provider payments, and utilization management practices. Together, these datasets offer a comprehensive view of utilization and payment patterns across different insurance types and patient populations in Connecticut. However, certain data points were unavailable for all three payer types in the same data source. Due to the need to use different data sources, we are unable to make direct comparisons between Medicare Advantage and Traditional Medicare. Furthermore, the methodologies used by the data sources to collect and process data may differ, meaning results derived from these datasets should not be interpreted as directly comparable. Additionally, utilization management is only available for Medicare Advantage enrollees within APCD. Table 1 presents a summary of the data sources utilized. For a detailed summary of the data sources, please refer to Appendix A2.

Table 1: Description of Data Sources			
Data Source	**Data Table**	**Enrollees Included**	**Year Covered**
CMS Integrated Data Repository	Medicare Monthly Enrollment	Traditional Medicare & Medicare Advantage	2021-2023
CMS Integrated Data Repository	Medicare Inpatient Hospitals - by Geography and Service	Traditional Medicare only	2021-2022
CMS Integrated Data Repository	Medicare Physician & Other Practitioners - by Geography and Service	Traditional Medicare only	2021-2022
CMS Integrated Data Repository	Medicare Outpatient Hospitals - by Geography and Service	Traditional Medicare only	2021-2022
CMS Integrated Data Repository	Hospital Service Area	Traditional Medicare only	2021-2022
CMS Integrated Data Repository	Medicare Post-Acute Care and Hospice - by Geography & Provider	Traditional Medicare only	2021-2022
CMS Integrated Data Repository	CMS Program Statistics - Medicare Part D	Traditional Medicare only	2021
Connecticut All-Payer Claims Database	Eligibility	Medicare Advantage & Medicaid	2021-2023
Connecticut All-Payer Claims Database	Medical Claims	Medicare Advantage & Medicaid	2021-2023
Connecticut All-Payer Claims Database	Pharmacy Claims	Medicare Advantage & Medicaid	2021-2023
Connecticut All-Payer Claims Database	Provider Details	Medicare Advantage & Medicaid	2021-2023

MEDICARE AND MEDICAID ENROLLMENT RESULTS

Table 2 presents Medicare and Medicaid enrollment in Connecticut from 2021 to 2023. Between 2021 and 2023, Medicare enrollment in Connecticut increased from 702,439 beneficiaries in 2021 to 724,632 in 2023. This growth was driven primarily by a rise in enrollment in Medicare Advantage plans, while enrollment in Traditional Medicare declined. Medicare prescription drug coverage enrollment mirrored these trends. These trends highlight the ongoing shift toward Medicare Advantage plans in Connecticut, both in overall enrollment and in prescription drug coverage. The lack of patient-level data available from CMS prevented analysis of enrollment by age for Traditional Medicare and Medicare Advantage. This information is reported in aggregate and is not limited to individuals aged 65 and older. The enrollment information for CT Medicaid is from APCD and is limited to enrollees over the age of 65.

Table 2: Medicare and Medicaid Enrollment in Connecticut from 2021 to 2023

	2021	2022	2023
Total Medicare Beneficiaries	702,439	706,293	724,632
Traditional Medicare Enrollees	363,399 (52%)	341,837 (48%)	331,320 (46%)
Medicare Advantage Enrollees	339,040 (48%)	364,456 (52%)	393,312 (54%)
CT Medicaid Enrollees (65+)	164,448	190,398	202,733
Medicare Prescription Drug Coverage	568,720	577,741	597,393
Traditional Medicare Prescription Drug Coverage	266,383 (47%)	232,761 (40%)	223,393 (38%)
Medicare Advantage Drug Coverage	302,337 (53%)	344,980 (60%)	374,000 (63%)

(Source: CMS Data-Medicare Monthly Enrollment Tables; APCD-Eligibility Tables)

MEDICARE AND MEDICAID PATIENT DEMOGRAPHICS RESULTS

Table 3 presents patient demographics of Medicare Enrollees in Connecticut from 2021 to 2023. The analysis revealed women represent 55% of the total Medicare population in Connecticut between 2021 and 2023. White enrollees also comprise a significant portion of the population. In contrast, Black, Hispanic, Asian, American Indian, and Other populations collectively represented less than 25% of total enrollees over the three years. The lack of patient-level data available from CMS limited the analysis from examining demographic differences between Traditional Medicare and Medicare Advantage enrollees. As shown in Table 4, Medicaid enrollees were predominantly female. Medicaid data is sourced from the APCD, which does not include information on race, limiting further demographic analysis.

Table 3. Demographic Profile of Medicare Enrollees in Connecticut for Traditional Medicare and Medicare Advantage Enrollees

	2021	2022	2023
Male	45%	45%	45%
Female	55%	55%	55%
White	78%	78%	77%
Black	8%	7%	8%
Asian	2%	2%	2%
Hispanic	7%	7%	8%
American Indian	<1%	<1%	<1%
Other	4%	5%	5%

(Source: CMS Data-Medicare Monthly Enrollment Tables)

Table 4. Demographic Profile of Medicaid Enrollees

	2021	2022	2023
Male	37%	38%	39%
Female	63%	62%	61%

(Source: APCD- Eligibility Enrollment Tables)

MEDICARE AND MEDICAID MEDICAL RESOURCE UTILIZATION RESULTS

Table 5 provides a descriptive comparison of the average frequency of service utilization for individuals with at least one claim under Medicare Advantage, Traditional Medicare or Medicaid from 2021 to 2023. The data highlights differences in utilization patterns across various services, including outpatient consultations, physical therapy, oncology, emergency department visits, hospice, home health care, and inpatient stays. Medicare Advantage and Medicaid data were sourced from the APCD, and Traditional Medicare data was sourced from CMS because it is not available in the APCD. As a result, results from these different datasets are not directly comparable. For a detailed breakdown and analysis of utilization by payer, please refer to Appendix A3.

The analysis revealed that Medicare Advantage beneficiaries generally utilized services at comparable or slightly lower frequencies than Medicaid beneficiaries, except for hospice and home health care. Hospice utilization was significantly higher among Medicaid beneficiaries, averaging 17 visits in 2021, peaking at 21 visits in 2022, and declining to 16 visits in 2023, compared to a consistent 5 visits per year for Medicare Advantage beneficiaries. Similarly, home health care utilization was substantially higher among Medicaid beneficiaries, rising from an average of 7 visits in 2021 to 11 visits in 2022, before declining to 9 visits in 2023, compared to 3–4 visits per year for Medicare Advantage enrollees. For other services, such as physical therapy and emergency department visits, Medicare Advantage beneficiaries showed slight increases over the period, while Medicaid utilization rates remained steady.

These findings highlight differences in service utilization patterns between Medicare Advantage and Medicaid, with Medicaid beneficiaries demonstrating significantly higher utilization of hospice and home health care, while Medicare Advantage beneficiaries maintained consistent or slightly increasing usage for most other services.

Table 5: Average Medicare and Medicaid Claim Resource Utilization (Frequency)				
Type of Claim	**Payer**	**2021**	**2022**	**2023**
Imaging	Traditional Medicare	2	2	N/A
	Medicare Advantage	4	4	4
	Medicaid	3	3	3
Outpatient Consultations	Traditional Medicare	2	2	N/A
	Medicare Advantage	2	3	2
	Medicaid	3	3	3
Physical Therapy	Traditional Medicare	2	2	N/A
	Medicare Advantage	3	4	4
	Medicaid	2	2	2
Oncology	Traditional Medicare	7	4	N/A
	Medicare Advantage	4	4	4
	Medicaid	3	3	3
Emergency Department	Traditional Medicare	2	2	N/A
	Medicare Advantage	3	4	4
	Medicaid	3	3	3
Hospice	Traditional Medicare	1	1	N/A
	Medicare Advantage	5	5	5
	Medicaid	17	21	16
Home Health	Traditional Medicare	3	2	N/A
	Medicare Advantage	3	4	4
	Medicaid	7	11	9
Inpatient Stays	Traditional Medicare	2	2	N/A
	Medicare Advantage	3	4	4
	Medicaid	3	4	3

(Source: CT APCD data- medical claims, CMS-Medicare Physician & Other Practitioners - by Geography and Service, CMS-Medical Outpatient Hospitals by Geography and Service, CMS- Medicare Post-Acute Care and Hospice - Geography and Service, CMS-Medical Inpatient Hospitals by Geography and Service)

MEDICARE AND MEDICAID DURATION OF CARE RESULTS

Table 6 compares the average duration of care in days for various claim types associated with a length of stay across Medicare Advantage and Medicaid from 2021 to 2023. Medicare Advantage and Medicaid data were sourced from the APCD, and Traditional Medicare data was sourced from CMS because it is not available in the APCD. As a result, results from these different datasets are not directly comparable.

Hospice care durations were significantly longer for Medicaid beneficiaries, increasing from 25 days in 2021 to 29 days in 2023, compared to 13–16 days for Medicare Advantage beneficiaries. For home health care, Medicaid also showed longer durations, with an increase from 13 days in 2021 to 16 days in 2022 before declining to 14 days in 2023, while Medicare Advantage averaged 10–12 days during the same period. Acute inpatient stays were comparable across payers, with Medicare Advantage averaging 7–9 days and Medicaid averaging 8–9 days. For non-acute inpatient stays, Medicaid beneficiaries had significantly longer durations, remaining steady at 21 days across all years, compared to a consistent 7–8 days for Medicare Advantage beneficiaries. For a detailed breakdown and analysis of duration of care, please refer to Appendix A3.

Table 6: Average Medicare Claim Resource Utilization (Duration of Care-Days)				
Type of Claim	**Payer**	**2021**	**2022**	**2023**
Hospice	Traditional Medicare	58	56	N/A
	Medicare Advantage	14	16	13
	Medicaid	25	26	29
Home Health	Traditional Medicare	9	8	N/A
	Medicare Advantage	11	12	10
	Medicaid	13	16	14
Inpatient Stays (Acute)	Traditional Medicare	N/A	N/A	N/A
	Medicare Advantage	7	9	7
	Medicaid	8	9	8
Inpatient Stays (Non-Acute)	Traditional Medicare	7	7	N/A
	Medicare Advantage	8	7	7
	Medicaid	21	21	21

(Source: CT APCD data- medical claims, CMS-Medicare Post-Acute Care and Hospice - Geography and Service, CMS-Hospital Service Area)

MEDICARE AND MEDICAID CLAIMS TOTAL PAYMENTS

Table 7 presents a detailed comparison of total charges and payments for various claim types across Medicare Advantage and Medicaid from 2021 to 2023. The table highlights the differences in charge amounts billed to payers and the amounts ultimately paid, providing insights into payment patterns for services such as imaging, outpatient consultations, physical therapy, oncology, emergency department visits, home health care, inpatient stays, and prescription medicines. Medicare Advantage and Medicaid data were sourced from the APCD, and Traditional Medicare data was sourced from CMS because it is not available in the APCD.

As a result, results from these different datasets are not directly comparable. For a detailed breakdown and analysis of payments by payer, please refer to Appendix A4.

The analysis of Medicare Advantage and Connecticut Medicaid payments across service types revealed distinct differences in payment patterns. Overall, Medicare Advantage plans consistently paid a higher proportion of charges compared to Medicaid for most services. For example, for outpatient consultations and oncology services, Medicare Advantage paid 24% and 42% of charges in 2023, respectively, while Medicaid paid only 8% and 21% for the same services. This pattern was observed across other services, including physical therapy and emergency department visits, where Medicare Advantage payments as a percentage of charges exceeded those of Medicaid.

Despite this finding, Medicaid paid more in absolute terms for certain services, particularly inpatient stays and imaging. For instance, in 2023, Medicaid paid $1,407 on average per beneficiary for an inpatient stay and $961 for imaging, compared to $993 and $470 paid by Medicare Advantage, respectively. These higher total payments by Medicaid often occurred in categories with larger charge amounts. However, Medicaid typically reimbursed a smaller proportion of the overall charges compared to Medicare Advantage.

These findings highlight significant differences in payment patterns between Medicare Advantage and Medicaid. While Medicaid often pays higher absolute amounts for services like inpatient stays and imaging, Medicare Advantage generally pays a higher percentage of the billed charges.

Table 7: Medicare and Medicaid Claim Total Payments							
Type of Claim	**Payer**	**2021**		**2022**		**2023**	
		Charge Amount	Paid Amount	Charge Amount	Paid Amount	Charge Amount	Paid Amount
Imaging	Traditional Medicare	$389	$76	$404	$74	N/A	N/A
	Medicare Advantage	$960	$285	$1,188	$394	$1,500	$470
	Medicaid	$2,929	$429	$1,739	$215	$2,869	$961
Outpatient Consultations	Traditional Medicare	$881	$185	$930	$190	N/A	N/A
	Medicare Advantage	$1,539	$293	$1,526	$404	$1,565	$378
	Medicaid	$2,081	$216	$2,046	$188	$2,087	$164
Physical Therapy	Traditional Medicare	$150	$76	$158	$74	N/A	N/A
	Medicare Advantage	$865	$242	$840	$232	$984	$278
	Medicaid	$1,733	$438	$1,801	$305	$1,704	$210
Oncology	Traditional Medicare	$164	$160	$266	$159	N/A	N/A
	Medicare Advantage	$3,000	$1,563	$2,854	$1,445	$4,129	$1,751
	Medicaid	$2,053	$232	$2,334	$404	$2,385	$489
Emergency Department	Traditional Medicare	$592	$144	$652	$160	N/A	N/A
	Medicare Advantage	$1,190	$332	$1,215	$323	$1,522	$410
	Medicaid	$1,918	$195	$2,100	$228	$2,478	$261
Home Health	Traditional Medicare	$4,722	$5,303	$4,529	$5260	N/A	N/A
	Medicare Advantage	$1,121	$267	$1,167	$298	$1,279	$313
	Medicaid	$1,745	$309	$1,379	$367	$1,847	$355
Inpatient Stays	Traditional Medicare	$2,629	$690	$2,835	$712	N/A	N/A
	Medicare Advantage	$4,015	$770	$4,446	$902	$3,920	$993
	Medicaid	$5,923	$1,264	$5,888	$1,219	$6,381	$1,407

(Source: CT APCD-pharmacy claims & medical claims, CMS-Medicare Physician & Other Practitioners - by Geography and Service, CMS-Medical Outpatient Hospitals- by Geography and Service, CMS-Medicare Post-Acute Care and Hospice - Geography and Service, Medical Inpatient Hospitals by Geography and Service)

MEDICARE ADVANTAGE UTILIZATION MANAGEMENT APPROACHES

Table 8 presents a summary of the use of prior authorization by Medicare Advantage plans from 2021 to 2023. Data on utilization management is only available for Medicare Advantage enrollees within APCD. The utilization management results should be interpreted with caution, as the data is not consistently reported across all payers.

Hospice care consistently required the highest percentage of prior authorizations. However, the sharp decrease from 2021 to 2022 and 2023 is attributed to Aetna reporting no data in 2021 and 0% in 2022 and 2023, significantly lowering the overall average for Medicare Advantage plans. These results should be interpreted with caution, as utilization management data for hospice under Medicare Advantage plans was consistently reported by only one payer—ConnectiCare. Other services with relatively high rates of prior authorization include home health (22%-24%) and emergency department visits (19%-25%). Requirements for telehealth grew from 7% to 12% over the same period. While some services, such as chiropractic care and imaging, showed steady but modest increases, others, like physical therapy, maintained relatively low and stable rates of prior authorization. For a detailed breakdown and analysis of prior authorization by payer, please refer to Appendix 5.

Table 8: Frequency of Medicare Advantage Utilization Management (Prior Authorization)				
Type of Claim	**Payer**	**2021**	**2022**	**2023**
Chiropractic Care	Medicare Advantage	6%	7%	9%
Dialysis	Medicare Advantage	4%	5%	7%
Durable Medical Equipment	Medicare Advantage	7%	8%	9%
Emergency Department	Medicare Advantage	19%	20%	25%
Home Health	Medicare Advantage	22%	24%	22%
Hospice	Medicare Advantage	97%	48%	48%
Imaging	Medicare Advantage	5%	6%	7%
Inpatient Stays (Acute)	Medicare Advantage	7%	7%	13%
Inpatient Stays (Non-Acute)	Medicare Advantage	9%	10%	12%
Oncology	Medicare Advantage	7%	7%	9%
Outpatient Consultations	Medicare Advantage	6%	6%	9%
Physical Therapy	Medicare Advantage	5%	4%	6%
Psychiatric Care	Medicare Advantage	5%	6%	8%
Telehealth	Medicare Advantage	7%	9%	12%

(Source: CT APCD- medical claims)

Table 9 presents a summary of the requirement for referrals by Medicare Advantage plans from 2021 to 2023. The data reveals significant variability in referral requirements across services within Medicare Advantage plans between 2021 and 2023. Hospice care consistently required the highest rate of referrals. High rates of referral were also observed for dialysis. Referral requirements for home health care and inpatient stays (acute and non-acute) rose steadily, reflecting increased utilization management efforts in these areas. For outpatient consultations and psychiatric care, referrals showed gradual increases over time, while services including durable medical equipment and telehealth maintained relatively stable rates. For a detailed breakdown and analysis of referrals being required by payers, please refer to Appendix A5.

Table 9: Frequency of Medicare Advantage Utilization Management (Referral Required)				
Type of Claim	**Payer**	**2021**	**2022**	**2023**
Chiropractic Care	Medicare Advantage	37%	37%	31%
Dialysis	Medicare Advantage	50%	53%	57%
Durable Medical Equipment	Medicare Advantage	42%	40%	42%
Emergency Department	Medicare Advantage	24%	27%	28%
Home Health	Medicare Advantage	28%	39%	40%
Hospice	Medicare Advantage	100%	64%	65%
Imaging	Medicare Advantage	31%	34%	32%
Inpatient Stays (Acute)	Medicare Advantage	17%	22%	26%
Inpatient Stays (Non-Acute)	Medicare Advantage	21%	20%	26%
Oncology	Medicare Advantage	31%	35%	37%
Outpatient Consultations	Medicare Advantage	21%	23%	27%
Physical Therapy	Medicare Advantage	47%	32%	42%
Psychiatric Care	Medicare Advantage	24%	29%	32%
Telehealth	Medicare Advantage	27%	30%	30%

(Source: CT APCD- medical claims)

Table 10 presents a summary of the claim denials by Medicare Advantage plans from 2021 to 2023. The data shows notable variation by service type, with an upward trend in denial rates for several categories. Hospice and non-acute inpatient stays consistently experienced high denial rates. Other areas with significant increases include emergency department claims and outpatient consultations. Durable medical equipment, imaging, and oncology claims also saw steady increases in denial rates over the period. Conversely, prescription medicines showed a decline in denials. For a detailed breakdown and analysis of claim denials by payer, please refer to Appendix A5.

Table 10: Frequency of Medicare Advantage Utilization Management (Claim Denials)				
Type of Claim	**Payer**	**2021**	**2022**	**2023**
Chiropractic Care	Medicare Advantage	18%	21%	23%
Dialysis	Medicare Advantage	17%	21%	22%
Durable Medical Equipment	Medicare Advantage	14%	17%	22%
Emergency Department	Medicare Advantage	19%	20%	25%
Home Health	Medicare Advantage	29%	31%	22%
Hospice	Medicare Advantage	25%	30%	33%
Imaging	Medicare Advantage	14%	15%	20%
Inpatient Stays (Acute)	Medicare Advantage	25%	24%	31%
Inpatient Stays (Non-Acute)	Medicare Advantage	21%	24%	33%
Oncology	Medicare Advantage	13%	17%	22%
Outpatient Consultations	Medicare Advantage	21%	21%	27%
Physical Therapy	Medicare Advantage	11%	19%	21%
Psychiatric Care	Medicare Advantage	20%	21%	26%
Telehealth	Medicare Advantage	20%	24%	27%

(Source: CT APCD- medical claims)

MEDICARE PHARMACY UTILIZATION AND UTILIZATION MANAGEMENT RESULTS

Table 11 presents a detailed comparison of pharmacy claims for Medicare Advantage and Medicaid beneficiaries from 2021 to 2023. The data highlights differences in the average number of prescriptions, the proportion of generic prescriptions, and the use of utilization management practices such as prior authorizations and claim denials. For a detailed breakdown and analysis of pharmacy claims by payer, please refer to Appendix A6.

The analysis revealed that Medicaid beneficiaries averaged more prescriptions annually than Medicare Advantage beneficiaries, increasing from 10 prescriptions in 2021 to 12 in 2023, compared to 9–10 prescriptions per year for Medicare Advantage enrollees. Both programs demonstrated high and stable use of generic prescriptions, with generic prescriptions being

85–89% of all claims. Medicare Advantage plans use of utilization management declined over time. For instance, prior authorization requirements decreased from 23% in 2021 to 11% in 2023, while claim denials decreased from 14% to 9% during the same period.

The significant discrepancy in the average number of prescriptions among Medicaid, Medicare Advantage plans, and Medicare can be attributed to differences in data sources and methodologies. Medicare data, sourced from CMS, includes only annual prescription drug fills for individuals with at least one prescription. In contrast, Medicare Advantage and Medicaid data, sourced from the APCD, allow for the calculation of the average number of prescriptions, including individuals with no prescription claims. This inclusion of patients without prescription claims lowers the average number of prescriptions. As a result, these findings are not directly comparable.

Table 11: Pharmacy Medicare Claims

Type of Claim	Payer	2021	2022	2023
Average number of prescriptions	Traditional Medicare	54	N/A	N/A
	Medicare Advantage	9	10	9
	Medicaid	10	10	12
Generic prescriptions	Traditional Medicare	N/A	N/A	N/A
	Medicare Advantage	89%	86%	85%
	Medicaid	85%	86%	85%
Prescriptions requiring prior authorization	Medicare Advantage	23%	14%	11%
Prescription claims denied	Medicare Advantage	14%	14%	9%

(Source: CT APCD data- pharmacy claims and medical claims, CMS Program Statistics - Medicare Part D)

MEDICARE PRESCRIPTION CLAIMS TOTAL PAYMENTS

Table 12 presents a detailed comparison of total charges and payments for prescription medicines under Medicare Advantage and Medicaid from 2021 to 2023. The table highlights differences in the amounts billed to payers and the amounts ultimately paid, providing insights into cost patterns for prescription claims. Medicare Advantage and Medicaid data were sourced from the APCD, and Traditional Medicare data was sourced from CMS because it is not available in the APCD. As a result, results from these different datasets are not directly comparable. For a detailed breakdown and analysis of prescription payments by payer, please refer to Appendix A6.

The analysis of Medicare Advantage and Medicaid payments for prescriptions revealed distinct differences in payment patterns. Medicare Advantage plans consistently paid a higher proportion of charges compared to Medicaid, with payment-to-charge ratios of approximately 50% in 2023, compared to Medicaid's 49%. For example, in 2023, Medicare Advantage beneficiaries incurred an average charge of $5,655 in prescriptions with $2,915 paid, while Medicaid beneficiaries faced lower average charges of $4,523 with $2,216 paid. Medicare Advantage showed relative stability in charges and payments over time, whereas Medicaid exhibited greater variability, including a notable reduction in paid amounts in 2022. While Medicaid generally incurred lower charges and paid amounts for prescriptions, Medicare Advantage maintained slightly higher reimbursement levels relative to the charge amount.

Table 12: Prescription Claim Total Payments

Type of Claim	Payer	2021		2022		2023	
		Charge Amount	Paid Amount	Charge Amount	Paid Amount	Charge Amount	Paid Amount
Prescriptions	Traditional Medicare	N/A	$5,419	N/A	N/A	N/A	N/A
	Medicare Advantage	$5,868	$2,858	$6,030	$3,093	$5,655	$2,915
	Medicaid	$5,469	$1,386	$2,673	$971	$4,523	$2,216

(Source: CT APCD data- pharmacy claims, CMS Program Statistics - Medicare Part D)

MEDICARE ADVANTAGE UTILIZATION MANAGEMENT PREDICTORS

The ANOVA analysis revealed several statistically significant predictors across utilization management approaches. Data on utilization management is only available for Medicare Advantage enrollees within APCD.

For prior authorizations, the strongest predictors were average charge amount ($p<0.001$) and insurer ($p<0.001$), with additional contributions from amount paid ($p<0.001$) and provider type ($p<0.001$). For claim denials, the most significant factors included average paid amount ($p<0.001$), average number of visits ($p<0.001$), and insurer ($p<0.001$). Similarly, for referrals, key predictors were insurer ($p<0.001$), average charge amount ($p<0.001$), and average paid amount ($p<0.001$).

For prior authorizations, the results suggest that provider type and average number of visits are consistently significant predictors across all payers. In contrast, charge amount and paid amount vary in significance, with some payers (e.g., Cigna, Anthem) showing strong associations, while others (e.g., United Healthcare, Harvard Pilgrim Health Care) show minimal impact. The analysis of prior authorization requirements reveals that certain services consistently require prior authorization across payers, while others show less variation. Hospice care, dialysis, telehealth, and imaging exhibit the highest and most consistent need for prior authorization. Additionally, inpatient acute care and inpatient non-acute care also demonstrate strong associations with prior authorization. In contrast, services such as outpatient consultations and physical therapy require prior authorization less consistently.

For requiring referrals, the results suggest provider type, average number of visits, charge amount, and paid amount vary in influence across payers. Provider type and average number of visits is consistently a significant predictor across all payers. In contrast, average charge amount and average paid amount show more variation. Cigna, Anthem, and UHC report significant results for both outcomes. However, for Aetna and Connecticare, neither charge amount nor paid amount significantly impacts referral requirements. Emergency Department, Medical Equipment,

Imaging, Oncology, Physical Therapy, and Inpatient Non-Acute Care consistently show the strongest association with requiring referrals.

For claim denials, the results suggest provider type and average number of visits is consistently a significant predictor across all payers. Average charge amount and average paid amount exhibit more variability across payers. Anthem and Connecticare show significant contributions for average charge amount, while Aetna reports a non-significant relationship. For average paid amounts, payers such as United Healthcare, Cigna, and Tufts Health Plan demonstrate significant associations, highlighting that paid amounts are more strongly linked to denials for these insurers. The analysis of claim denials across service types reveals that certain services experience denials most consistently, while others are less affected. Services with the highest and most consistent denials include emergency department, chiropractic care, home health, imaging, hospice, and inpatient care—both acute and non-acute. In contrast, services such as telehealth and prescription medicines show lower denial patterns. For a detailed breakdown of the ANOVA results for utilization management approaches by payer and by service, please refer to Appendix A7.

CONCLUSION

This study reveals significant differences in costs, utilization patterns, and utilization management practices across Medicare Advantage and Medicaid programs. For medical claims, Medicare Advantage plans consistently pay a higher proportion of charges compared to Medicaid, while Medicaid often pays higher absolute costs for specific services such as inpatient stays and imaging. For pharmacy claims, Medicare Advantage pays a higher proportion of prescription charges and more per prescription on average, though Medicaid demonstrates greater variability in charges and payments.

Utilization patterns highlight that Medicare Advantage beneficiaries have higher usage of services including physical therapy and emergency department visits, while Medicaid beneficiaries have higher usage of home health care and experience longer durations of care for

hospice, home health, and non-acute inpatient stays. For prescription medicines, Medicaid beneficiaries averaged more prescriptions annually, though both programs maintained a high use of generic medications.

The analysis of utilization management approaches shows that prior authorization, referrals, and claim denials vary significantly by service type and payer. Prior authorizations are most consistently required for hospice, dialysis, telehealth, imaging, and inpatient care, while referrals are most frequently associated with emergency department visits, imaging, oncology, and inpatient non-acute care. Claim denials are highest for services such as emergency department, home health, imaging, hospice, and inpatient care, while telehealth and prescription medicines experience lower denial rates. Predictive analyses further reveal that provider type and average number of visits are consistent predictors of prior authorizations, referrals, and denials across payers, while financial metrics such as charge amounts and paid amounts show more variable significance, depending on the insurer. Cigna, Anthem and Tufts Health Plan demonstrate strong associations between charge amounts and/or paid amounts with the use of prior authorizations, referrals, and denials; however, these factors have minimal impact for United Healthcare, Harvard Pilgrim Health Care, Aetna and Connecticare.

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APPENDIX

APPENDIX A1: Utilization Management and Provider Payment Practices of Medicare Advantage Plans Statistical Analysis Plan

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ABSTRACT

This study aims to analyze utilization and provider payment practices among insured individuals over 65 in Connecticut, focusing on various insurance types including Fee-for-Service Medicare, Medicaid, Medicare-Medicaid, Medicare Advantage, and other health plans. The primary objectives include examining utilization and provider payments by insurance type and provider type, comparing utilization patterns and costs, and exploring factors influencing these differences, such as utilization management practices and their impact on non-Medicare payments. Data from the Centers for Medicare & Medicaid Services (CMS) Integrated Data Repository and CT All-Payer Claims Database (APCD) for 2021-2023 will be used for the primary objective. The secondary objective aims to investigate the impact of claims denials, appeals, and prior authorizations on utilization and payment practices, leveraging the detailed data available in the Connecticut All-Payer Claims Database. The analysis will involve statistical tests, regression models, and data visualization to identify trends and relationships. Limitations of this approach include the CMS data's temporal coverage and lack of detailed information on denials and prior authorizations, which the APCD data will address. The findings will provide insights into improving care for Medicare Advantage beneficiaries and understanding the broader impacts of Medicare Advantage practices.

RATIONALE & BACKGROUND

Insurance utilization practices can significantly impact the healthcare services received by older adults. Understanding these impacts across different insurance types helps identify disparities and areas for improvement. This study will investigate these practices in Connecticut, leveraging extensive datasets from the CMS Integrated Data Repository and the CT All-Payer Claims Database to provide a detailed analysis of utilization patterns, costs, and outcomes.

This study is motivated by the need to understand the effects of utilization management and provider payment practices on the elderly population in Connecticut, particularly those enrolled in Medicare Advantage plans. Previous reports have highlighted significant disparities in primary care access, with Hispanic residents five times more likely and Black residents twice as likely as White residents to report not having a personal doctor in 2022. Additionally, primary care spending accounted for only 4.9% of the total medical expenses in 2022, falling short of the

5.3% target. These trends underscore the need for targeted interventions to improve healthcare equity and access.

Furthermore, The Connecticut Office of Health Strategy (OHS) has been monitoring healthcare spending growth and setting benchmarks to control costs. According to the Connecticut Cost Growth Benchmark Report CY2022, per person spending on healthcare in Connecticut increased by 3.4% in 2022, exceeding the 3.2% cost growth benchmark. This increase was driven primarily by retail pharmacy spending, hospital outpatient services, and professional physician services. These findings highlight the urgent need for effective cost management strategies in the state's healthcare system. By examining the utilization management and provider payment practices, this study aims to identify cost drivers and inefficiencies within the Medicare Advantage plans, thereby contributing to the overarching goal of developing strategies to improve healthcare equity, access, and cost management for the elderly population in Connecticut.

RESEARCH QUESTIONS & OBJECTIVES

Primary Research Objectives

- Examine utilization and provider payment practices of insured individuals over 65. The particular focus will be on how these factors differ with people with Medicare Advantage plans.
- Compare utilization and provider payments by insurance and provider type.
- Investigate the impact of utilization and provider payment practices on hospital outpatient and impact services, including patient placement, discharges and transfers.
- Assess the effect of utilization management practices on non-Medicare payments.

Secondary Research Objectives

- Explore the rates of denials, appeals, and prior authorizations in Connecticut.
- Assess the impact of denials, appeals, and prior authorizations on utilization and provider payment practices.
- Assess the impact of denials, appeals, and prior authorizations among Medicare Advantage plans with traditional Medicare, Medicaid, and commercial insurance plans.

- Assess the impact of high-growth cost drivers, such as pharmacy spending, hospital outpatient services, and professional physician services, on the Medicare Advantage population.

Table 1: Primary and Secondary Research Questions and Objective

Type	Research Question	Objective
Primary	What are the utilization and provider payment practices among insured individuals over the age of 65 in Connecticut?	Examine utilization and provider payment practices in total,by insurance and provider type. Analysis will include hospital outpatient and inpatient services, behavioral health services, and discharges.
Primary	How do utilization and provider payments vary by insurance type and provider type?	Compare utilization and provider payments by insurance and provider type, including hospital outpatient and inpatient services, behavioral health services, and discharges.
Primary	What factors influence differences in utilization and provider payments among insured individuals over the age of 65?	Explore the potential factors influencing differences in utilization and provider payments, including utilization management practices and the effect of these practices on non-Medicare payments. Explore differences between total days of care and covered days of care.
Secondary	How many visits lead to transfers or hospitalizations?	Explore the rates at which patients are transferred or hospitalized during visits. Explorations will include insurance type and service type.
Secondary	What are the rates of prior authorization, denials, and appeals?	Explore the rates and frequencies of claims prior authorizations, denials, and appeals.
Secondary	How do denials, appeals, and prior authorizations impact utilization and provider payment practices?	Assess if denials, appeals, and prior authorizations may be impacting utilization and provider payment practices.

RESEARCH METHODS

- **Study Design:** This study is an observational study using retrospective data analysis.
- **Setting**: Connecticut, with a focus on insured individuals over 65.
    - *Context and Rationale for definition of time 0:*
        - January 1, 2021 is the start of the study period, allowing us to capture data from the beginning of the full calendar year desired for our study.

Table 2: Operational Definition of Time 0 (index date) and other primary time anchors

Time Point	Description
Time 0 (Index Date)	January 1, 2021
End of Study	December 31, 2023

- *Context and Rationale for study inclusion criteria:*
    - Inclusion Criteria:
        - Age 65 and older
        - Persons enrolled in Fee-for-Service Medicare, Medicaid, Medicare-Medicaid, Medicare Advantage and Other Health Plan enrollees.
        - Residents of Connecticut
    - Rationale: These criteria focus on older adults in Connecticut, ensuring the study captures relevant data on a significant population segment affected by these insurance practices

STUDY DESIGN DIAGRAM

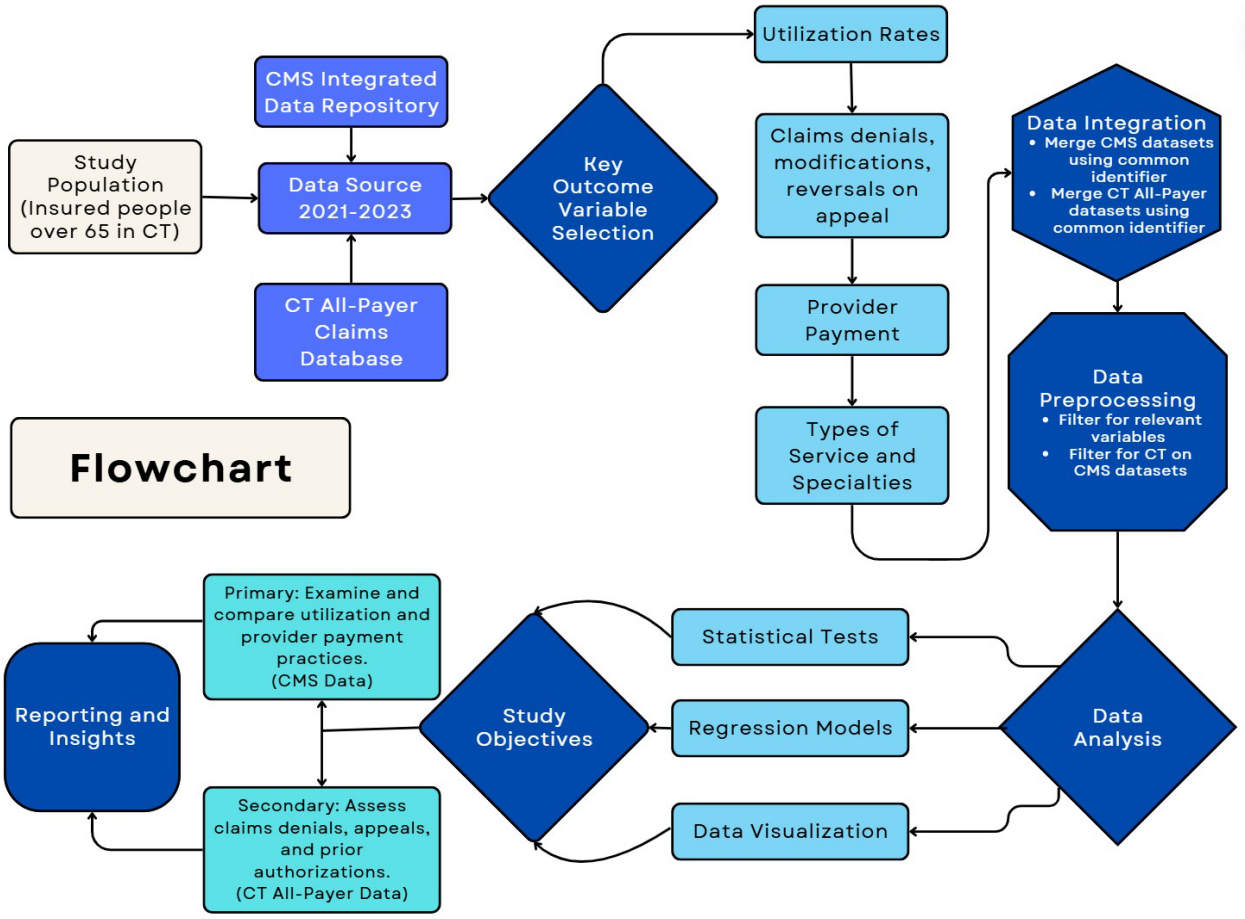

Table 3: Operational Definitions of Inclusion Criteria

Criterion	Operational Definition
Age	65 years and older
Insurance Type	Fee-for-Service Medicare, Medicaid, Medicare-Medicaid, Medicare Advantage and Other Health Plan enrollees.
Residency	Connecticut

- *Context and rationale for study exclusion criteria:*
  - Exclusion Criteria:
    - Individuals under 65
    - Uninsured individuals
    - Non-residents of Connecticut
  - Rationale: Excluding these groups ensures the study focuses on the target population most affected by Medicare and related insurance policies

Table 4: Operational Definitions of Exclusion Criteria

Criterion	Operational Definition
Age	Under 65
Insurance Status	Uninsured individuals
Residency	Non-Connecticut residents

- **Variables:**
  - *Context and rationale for exposure(s) of interest:*
    - The exposures of interest include different insurance types (Medicare Advantage, Traditional Medicare, Medicaid, Commercial insurance).
    - Additional variables of interest include age, provider payment, provider specialty, claims denials, appeals, and prior authorizations.

Table 5: Operational Definitions of Exposure

Exposure	Definition
Medicare Advantage	Managed care plans offered by private companies. Will be specified by plan types available and companies (i.e. Blue Cross Blue Shield, United Health Care, etc).
Traditional Medicare	Fee-for-service health plan
Medicaid	State and federal program providing health coverage based on income
Commercial Insurance	Health plans offered by private insurers

- *Context and rationale for outcome(s) of interest*
  - Outcomes include utilization rates, provider payments, claims denials, modifications, and reversals on appeal.
  - Utilization Rates: The frequency and distribution of healthcare services used by insured individuals.
    - Rationale - Understanding utilization rates helps in identifying patterns of healthcare access and use, which can inform resource allocation and policy decisions.
  - Provider Payments: Payments made to healthcare providers for services rendered to insured individuals.
    - Rationale - Analyzing provider payments is crucial to assess the financial aspects of healthcare delivery, including cost efficiency and provider incentives.
  - Claims Denials, Modifications, Prior Authorizations, and Reversals on Appeal: The rates and reasons for claims denials, prior authorizations, subsequent modifications, and outcomes of appeals.
    - Rationale - Investigating these metrics provides insights into the administrative aspects of healthcare delivery and the impact on both providers and patients.

- Utilization and provider payment comparison: Comparing utilization and provider payments by insurance type and provider type.
    - Context: Includes comparisons among hospital outpatient and inpatient services, discharges, home health care, physical therapy, rehabilitation, imaging(advanced and standard), and pharmacy medications.
    - Rationale: This comprehensive comparison allows for a detailed understanding of how different insurance types and provider settings influence healthcare delivery and costs.

Table 6: Operational Definitions of Outcome

Outcome	**Definition**
Utilization Rate	Frequency of service usage
Provider Payments	Amount paid to providers
Claims Denials	Refusal of claim payment
Authorization Needed Code	Prior authorizations for services and prescriptions

- *Context and rationale for follow up*
    - Follow-up involves monitoring utilization and payment patterns throughout the study period to identify trends and impacts.

Table 7: Operational Definitions of Follow Up

Follow Up	Definition
Monitoring Period	January 1, 2021 - December 31, 2023

- *Context and rationale for covariates*
  - Covariates include patient demographics, comorbidities, and socioeconomic status.

Table 8: Operational Definitions of Covariates

Covariates	Definition
Age	Member age by date of birth
Gender Code	Member gender
Disease Management Indicator Code	Indicates where or not the member was enrolled in a disease management program
Disability Indicator Code	Indicates whether or not disability applied to the member record
Employment Status	Defines the employment status of the subscriber
Total Monthly Premium Amount	Identifies the total monthly premium at the subscriber level

- **Data Analysis**
  - *Context and Rational Analysis Plan*

- Data analysis will be conducted using Python and R, employing statistical tests, regression models, and visualization tools to assess utilization patterns, cost differences, and the impact of utilization management practices.
- The primary analysis will be conducted using CMS data. Several datasets will be used including Medicare Geographic Variation, Medicare Monthly Enrollment, Medicare Inpatient Hospital, Medicare Outpatient Facility, Medicare Part A & B – All Types of Service, and Medicare Outpatient Hospitals - by Provider and Service. Data will be filtered for CT.
- The secondary analysis will be conducted using data from the CT APCD. Data tables of interest include Eligibility, Medical, Medical Claims Table, Pharmacy Claim Table, and Provider. The relevant variables will be selected from each table and the necessary tables will be merged together using a common variable.
- **Descriptive Analysis**:
    - Calculate the frequency and distribution of services.
    - Visualize data using bar charts or histograms.
    - Analyze enrollment and utilization patterns by insurance type.
- **Cost Analysis**:
    - Examine cost differences across insurance types.
- **Comparative Analysis:**
    - Compare utilization and costs across insurance types.
    - Identify significant differences using statistical tests.
    - Compare utilization and cost among different hospitals and providers.
- **Exploratory Analysis:**
    - Identify trends in enrollment and utilization patterns.
    - Analysis of relationships between variables such as cost, utilization, and patient demographics.

Table 9: Primary, Secondary, and Subgroup Analysis Specification

Analysis Type	Specification
Primary Analysis	Examining overall utilization and provider payment practices. Comparing utilization and enrollment by insurance type and provider type.
Secondary Analysis	Explore the rates and frequencies of claims prior authorizations, denials, and appeals. Assess if denials, appeals, and prior authorizations may be impacting utilization and provider payment practices.

- **Data Sources**
  - *Context and Rationale for data sources:*
    - The data used for this study is sourced from the CMS Integrated Data Repository. CMS is part of the Department of Health and Human Services and provides health coverage to more than 100 million people through Medicare, Medicaid, the Children's Health Insurance Program, and the Health Insurance Marketplace. The insurance types accessible through the CMS repository datasets include Medicaid, Medicare, Medicare-Medicaid enrollees, Medicare Advantage and Other Health Plan enrollees, Hospital Insurance, Supplementary Medical Insurance, and Fee-for-Service (traditional health care system).
    - The data from CMS is available in open, accessible, and machine-readable formats. To obtain the data, navigate to the CMS Integrated Data Repository website and search for the desired dataset under the "Explore Data" tab. From there, you can view the available datasets and utilize the

      "View Data" button to access an interactive display. The display allows for filtering, and in our study, datasets have been filtered for "CT" (Connecticut) to focus on the relevant data. After exploring and filtering the datasets, you can download them directly to your computer's hard drive as CSV files. These files are compatible with various data analysis tools, including Python, and RStudio, facilitating seamless integration and analysis. All downloaded data will be stored

on Evidence Impact Lab's Snowflake server. The datasets will be filtered to only include Connecticut, displayed as CT, within the datasets and categorical variables will be converted into numerical format where necessary. The datasets will be merged based on common identifiers such as provider IDs and facility IDs. Data from CMS will be used to conduct analysis on the primary research questions and objectives.

- The second portion of data used for this study is sourced from the Connecticut All-Payer Claims Database (CT APCD). The CT APCD is a comprehensive repository that aggregates health insurance claims data from a variety of public and private payers with the primary aim of enhancing healthcare transparency, quality, and cost-effectiveness. This database collects extensive data, including medical, pharmacy, and dental claims, as well as eligibility, enrollment, provider, and health plan information. Contributors to the database include private health insurers, public health plans like Medicare and Medicaid, third-party administrators, and pharmacy benefit managers.
- The CT APCD is not open source. Access to the data is restricted and typically requires approval from the Office of Health Strategy in Connecticut, which oversees the database. The data is provided to authorized users, such as researchers, policymakers, and healthcare organizations, under strict usage and confidentiality agreements to ensure privacy and data security. Data used from CT APCD will be used for the secondary research questions and objectives.

Table 10: Metadata about Data Sources and Software

Data Source	Description	Software
CMS Integrated Data Repository	National data on Medicare and Medicaid beneficiaries	R
Connecticut All-Payer Claims Database	State-level data on all insured individuals	R

- **Data Management**
    - Data will be securely stored on AWS and managed using the Evidence Impact Labs account for collaboration. Data cleaning and preprocessing will ensure consistency and accuracy.

- **Study Size and Feasibility**
    - The study will include all insured individuals over the age of 65 in Connecticut, providing a comprehensive sample for analysis.

LIMITATIONS OF THE METHODS

Data completeness is a limitation, with datasets available only up to 2022. Also, data from the Centers for Medicare & Medicaid Services (CMS) does not provide consistent information across different insurance types, resulting in gaps that limit our ability to conduct comparative analyses for certain metrics.

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APPENDIX A2: Descriptions of Primary Data Sources

CMS Integrated Data Repository

The CMS Program Statistics, created by the CMS Office of Enterprise Data and Analytics (OEDA), provides data on Medicare populations, service utilization, expenditures, and certified providers. The Use and Payment reports include information derived from administrative enrollment, claims, and encounter data, on the utilization and payment for inpatient and outpatient services, skilled nursing facilities, home health agencies, hospice, and physician/non-physician practitioner/suppliers. These reports also include data on Medicare Part D utilization, drug costs, and premiums. Claims and encounter data, as well as prescription drug events, are stored in the CMS Chronic Conditions Data Warehouse (CCW).

The OEDA's analytical approach allows them to integrate and analyze Medicare Advantage service data from inpatient hospitals, skilled nursing facilities, outpatient facilities, professional services, and durable medical equipment within the existing database for Traditional Medicare's fee-for-service program. It has enabled them to measure utilization among Medicare Advantage enrollees between 2016 and 2021.

Medicare Monthly Enrollment

The Medicare Monthly Enrollment data provides current monthly information on the number of Medicare beneficiaries with hospital/medical coverage and prescription drug coverage, available for several geographic areas including national, state/territory, and county. The hospital/medical coverage data can be broken down further by health care delivery (Original Medicare versus Medicare Advantage and Other Health Plans) and the prescription drug coverage data can be examined by those enrolled in stand-alone Prescription Drug Plans and those enrolled in Medicare Advantage Prescription Drug plans. The dataset provides monthly and yearly enrollee trends.

Medicare Inpatient Hospitals - by Geography and Service

The Medicare Inpatient Hospitals by Geography and Service dataset provides information on hospital discharges for Original Medicare Part A beneficiaries by IPPS hospitals. This dataset contains information on the number of discharges, payments, and submitted charges organized by geography and Medicare Severity Diagnosis Related Group (DRG).

Medicare Physician & Other Practitioners - by Geography and Service

The Medicare Physician & Other Practitioners by Geography and Service dataset contains information on use, payments, submitted charges, and beneficiary demographic and health characteristics organized by geography, Healthcare Common Procedure Coding System (HCPCS) code, and place of service.

Medicare Outpatient Hospitals - by Geography and Service

The Medicare Outpatient Hospitals by Geography and Service dataset provides information on services for Original Medicare Part B beneficiaries by OPPS hospitals. These datasets contain information on the number of services, payments, and submitted charges organized by geography and comprehensive Ambulatory Payment Classification (APC).

Hospital Service Area

The Hospital Service Area data is a summary of calendar year Medicare inpatient hospital fee-for-service and Medicare Advantage claims data. It contains number of discharges, total days of care, and total charges summarized by hospital provider number and the ZIP code of the Medicare beneficiary.

Medicare Post-Acute Care and Hospice - by Geography & Provider

The Medicare Post-Acute Care and Hospice Provider Utilization and Payment Public Use Files (PAC PUF) contains information on demographic and clinical characteristics of beneficiaries served, professional and paraprofessional service utilization, and payment information at the provider, state, and national levels for each PAC setting (i.e. HHA, hospices, SNF, IRF, and LTCH). There are additional datasets which can be found as a downloadable report under 'Resources', which include information specific to the unique variables (e.g., case-mix groups) for HHAs, SNFs and IRFs.

CMS Program Statistics - Medicare Part D

The CMS Program Statistics - Medicare Part D tables provide use and Part D drug costs by type of Part D plan (stand-alone prescription drug plan and Medicare Advantage prescription drug plan).

Connecticut All-Payer Claims Database

Established in 2012, Connecticut's All-Payer Claims Database (APCD) stores insurance claims data for the state. Public payers, such as Medicaid and Medicare, along with commercial payers like Aetna, Anthem, Caremark, Cigna, Connecticare, Express Scripts, Harvard Pilgrim, Healthy CT, United Healthcare, and WellCare, are required to submit data if they have over 3,000

patients. This comprehensive database includes information on service utilization, costs, and quality, all of which are available for analysis and updated quarterly. With over one billion claims available for request, the initial requests process includes an informational meeting with the Office of Health Strategy (OHS). During this meeting, privacy and security requirements are reviewed, the best approach for tailoring requests is discussed, the application process is explained, and pricing is provided. Request applications can be submitted via the online application portal for a non-refundable fee of $50. All requests must adhere to federal and state privacy laws, including HIPAA.

Eligibility, medical claims, pharmacy claims, and provider details are required to be reported monthly, with data submitted within 30 business days following the end of the previous month.

APPENDIX A3: Medicare medical claim utilization data tables by payer

(sourced from APCD Medical Claims)

Utilization trends reveal significant differences among insurers. Aetna and United Healthcare generally exhibit consistent and slightly higher utilization across services like hospice and home health compared to other Medicare Advantage plans. Anthem shows moderate increases in utilization over time, particularly in hospice and dialysis services. In contrast, Cigna consistently reports some of the lowest utilization rates, especially for hospice and emergency department visits. Harvard Pilgrim Health Care demonstrates sporadic variability, with high utilization in certain services, such as dialysis, but minimal usage in others, such as home health. WellCare Health Plans Inc displays moderate increases in utilization, particularly for dialysis and hospice services. Lastly, Tufts Health Plan consistently reports some of the lowest utilization rates across most services.

Table 1: Healthcare Resource Utilization per Person with Utilization (Inpatient Acute Care)			
	2021	**2022**	**2023**
Inpatient Acute Care (Average Number of Visits)			
Aetna	3	3	4
Anthem	3	4	4
Cigna	3	3	3
Connecticare	3	3	4
Harvard Pilgrim Health Care	3	7	3
Tufts Health Plan	3	3	4
United Healthcare	4	4	4
WellCare Health Plans Inc	3	3	4
Medicare Advantage Overall	3	4	4
CT Medicaid	3	3	3

Table 2: Healthcare Resource Utilization per Person with Utilization (Inpatient Non-Acute Care)			
	2021	**2022**	**2023**
Inpatient Non-Acute Care (Average Number of Visits)			
Aetna	3	3	4
Anthem	2	3	3
Cigna	2	3	2
Connecticare	3	3	3
Harvard Pilgrim Health Care	3	5	1
Tufts Health Plan	3	3	3
United Healthcare	4	4	4
WellCare Health Plans Inc	3	3	4
Medicare Advantage Overall	3	3	3
CT Medicaid	3	4	4

Table 3: Healthcare Resource Utilization per Person with Utilization (Inpatient Acute Care-Length of Stay)			
	2021	**2022**	**2023**
Inpatient Acute Care (Average Length of Stay per Visit)			
Aetna	5	5	4
Anthem	6	8	8
Cigna	9	9	7
Connecticare	9	9	9
Harvard Pilgrim Health Care	5	14	3
Tufts Health Plan	7	12	7
United Healthcare	7	7	7
WellCare Health Plans Inc	5	7	8
Medicare Advantage Overall	7	9	7
CT Medicaid	8	9	8

Table 4: Healthcare Resource Utilization per Person with Utilization (Inpatient Non-Acute Care Length of Stay)			
	2021	**2022**	**2023**
Inpatient Non-Acute Care (Average Length of Stay per Visit)			
Aetna	8	5	4
Anthem	10	10	11
Cigna	10	9	14
Connecticare	11	11	11
Harvard Pilgrim Health Care	3	4	2
Tufts Health Plan	7	4	5
United Healthcare	9	9	9
WellCare Health Plans Inc	10	5	4
Medicare Advantage Overall	8	7	7
CT Medicaid	21	21	21

Table 5: Healthcare Resource Utilization per Person with Utilization (Hospice)			
	2021	**2022**	**2023**
Hospice (Average Number of Visits)			
Aetna	5	4	6
Anthem	5	5	4
Cigna	2	2	2
Connecticare	3	3	3
Harvard Pilgrim Health Care	6	2	3
Tufts Health Plan	1	2	1
United Healthcare	5	5	6
WellCare Health Plans Inc	3	4	4
Medicare Advantage Overall	5	5	5
CT Medicaid	17	21	16

Table 6: Healthcare Resource Utilization per Person with Utilization (Hospice-Length of Stay)			
	2021	**2022**	**2023**
Hospice (Average Duration of Care)			
Aetna	7	1	9
Anthem	2	7	5
Cigna	19	20	10
Connecticare	15	16	16
Harvard Pilgrim Health Care	N/A	N/A	N/A
Tufts Health Plan	15	38	29
United Healthcare	15	4	6
WellCare Health Plans Inc	N/A	14	2
Medicare Advantage Overall	14	16	13
CT Medicaid	25	26	29

Table 7: Healthcare Resource Utilization per Person with Utilization (Home Health)			
	2021	**2022**	**2023**
Home Health (Average Number of Visits)			
Aetna	3	4	4
Anthem	2	3	3
Cigna	2	2	2
Connecticare	3	3	3
Harvard Pilgrim Health Care	1	1	1
Tufts Health Plan	2	2	2
United Healthcare	4	4	4
WellCare Health Plans Inc	3	3	5
Medicare Advantage Overall	3	4	4
CT Medicaid	7	11	9

Table 8: Healthcare Resource Utilization per Person with Utilization (Home Health-Length of Stay)			
	2021	**2022**	**2023**
Home Health (Average Duration of Care)			
Aetna	9	11	5
Anthem	7	8	9
Cigna	15	13	8
Connecticare	15	15	15
Harvard Pilgrim Health Care	15	5	2
Tufts Health Plan	14	33	26
United Healthcare	7	8	8
WellCare Health Plans Inc	7	6	5
Medicare Advantage Overall	11	12	10
CT Medicaid	13	16	14

Table 9: Healthcare Resource Utilization per Person with Utilization (Emergency Department)			
	2021	**2022**	**2023**
Emergency Department (Average Number of Visits)			
Aetna	3	3	4
Anthem	3	4	5
Cigna	3	3	3
Connecticare	3	3	4
Harvard Pilgrim Health Care	4	6	2
Tufts Health Plan	3	2	3
United Healthcare	4	4	4
WellCare Health Plans Inc	4	4	4
Medicare Advantage Overall	3	4	4
CT Medicaid	3	3	3

Table 10: Healthcare Resource Utilization per Person with Utilization (Outpatient Consultations)			
	2021	**2022**	**2023**
Outpatient Consultations (Average Number of Visits)			
Aetna	3	2	3
Anthem	2	3	3
Cigna	2	2	2
Connecticare	2	2	3
Harvard Pilgrim Health Care	1	3	1
Tufts Health Plan	2	2	3
United Healthcare	3	3	3
WellCare Health Plans Inc	2	2	2
Medicare Advantage Overall	2	3	2
CT Medicaid	3	3	3

Table 11: Healthcare Resource Utilization per Person with Utilization (Psychiatric Care)			
	2021	**2022**	**2023**
Psychiatric Visits (Average Number of Visits)			
Aetna	5	4	6
Anthem	4	5	6
Cigna	4	4	4
Connecticare	5	5	5
Harvard Pilgrim Health Care	4	4	2
Tufts Health Plan	3	4	4
United Healthcare	5	6	5
WellCare Health Plans Inc	4	4	5
Medicare Advantage Overall	4	5	5
CT Medicaid	3	4	4

Table 12: Healthcare Resource Utilization per Person with Utilization (Physical Therapy)			
	2021	**2022**	**2023**
Physical Therapy (Average Number of Visits)			
Aetna	3	3	5
Anthem	3	4	5
Cigna	4	4	4
Connecticare	4	4	4
Harvard Pilgrim Health Care	3	3	2
Tufts Health Plan	3	3	3
United Healthcare	4	5	5
WellCare Health Plans Inc	4	4	4
Medicare Advantage Overall	3	4	4
CT Medicaid	2	2	2

Table 13: Healthcare Resource Utilization per Person with Utilization (Imaging)			
	2021	**2022**	**2023**
Imaging - Standard & Advanced (Average Number of Visits)			
Aetna	4	4	5
Anthem	3	4	6
Cigna	4	4	4
Connecticare	4	4	5
Harvard Pilgrim Health Care	4	6	2
Tufts Health Plan	3	3	4
United Healthcare	5	5	5
WellCare Health Plans Inc	4	5	5
Medicare Advantage Overall	4	4	4
CT Medicaid	3	3	3

Table 14: Healthcare Resource Utilization per Person with Utilization (Oncology Treatments)			
	2021	**2022**	**2023**
Oncology & Chemotherapy Treatment (Average Number of Visits)			
Aetna	4	3	5
Anthem	3	4	6
Cigna	3	3	3
Connecticare	4	4	4
Harvard Pilgrim Health Care	3	6	3
Tufts Health Plan	3	4	4
United Healthcare	4	5	4
WellCare Health Plans Inc	4	4	4
Medicare Advantage Overall	4	4	4
CT Medicaid	3	3	3

Table 15: Healthcare Resource Utilization per Person with Utilization (Dialysis)			
	2021	**2022**	**2023**
Dialysis (Average Number of Visits)			
Aetna	3	4	3
Anthem	3	4	4
Cigna	2	3	2
Connecticare	3	3	3
Harvard Pilgrim Health Care	7	15	16
Tufts Health Plan	2	2	4
United Healthcare	4	4	3
WellCare Health Plans Inc	6	8	12
Medicare Advantage Overall	4	5	6
CT Medicaid	6	3	3

Table 16: Healthcare Resource Utilization per Person with Utilization (Chiropractic Care)			
	2021	**2022**	**2023**
Chiropractic Care (Average Number of Visits)			
Aetna	2	3	3
Anthem	2	3	3
Cigna	3	3	3
Connecticare	3	3	3
Harvard Pilgrim Health Care	1	4	3
Tufts Health Plan	3	3	3
United Healthcare	3	3	3
WellCare Health Plans Inc	2	3	3
Medicare Advantage Overall	3	3	3
CT Medicaid	2	2	3

Table 17: Healthcare Resource Utilization per Person with Utilization (Telehealth)			
	2021	**2022**	**2023**
Telehealth (Average Number of Visits)			
Aetna	2	2	2
Anthem	2	2	2
Cigna	2	2	2
Connecticare	2	2	2
Harvard Pilgrim Health Care	3	9	1
Tufts Health Plan	2	2	3
United Healthcare	3	3	2
WellCare Health Plans Inc	2	3	3
Medicare Advantage Overall	2	3	2
CT Medicaid	2	2	2

Table 18: Healthcare Resource Utilization per Person with Utilization (Durable Medical Equipment)			
	2021	**2022**	**2023**
Durable Medical Equipment (Average Number of Orders)			
Aetna	2	2	3
Anthem	2	2	3
Cigna	2	3	3
Connecticare	3	3	3
Harvard Pilgrim Health Care	2	2	1
Tufts Health Plan	3	3	3
United Healthcare	3	3	3
WellCare Health Plans Inc	2	3	3
Medicare Advantage Overall	2	3	3
CT Medicaid	2	2	2

APPENDIX A4: Medicare medical claim payment data tables by payer
(sourced from APCD Medical Claims)

The analysis reveals significant variations in provider payments across insurers and services. Aetna and United Healthcare consistently report higher charge and paid amounts compared to other Medicare Advantage plans, particularly for services like outpatient consultations, inpatient acute care, and psychiatric care. Conversely, Cigna and Tufts Health Plan consistently report some of the lowest payments.

Table 1: Provider Payments per Person with Utilization (Inpatient Acute Care)						
	2021		**2022**		**2023**	
Inpatient Acute Care (Average per Stay)	Charge Amount	Paid Amount	Charge Amount	Paid Amount	Charge Amount	Paid Amount
Aetna	$1,868	$502	$2,087	$592	$2,459	$839
Anthem	$1,393	$515	$1,890	$488	$2,017	$540
Cigna	$1,293	$359	$1,580	$429	$1,612	$426
Connecticare	$1,841	$534	$2,027	$525	$2,017	$548
Harvard Pilgrim Health Care	$1,569	$160	$1,984	$558	$2,421	$625
Tufts Health Plan	$1,266	$283	$1,033	$356	$1,671	$398
United Healthcare	$2,890	$623	$3,425	$712	$3,464	$790
WellCare Health Plans Inc	$1,918	$249	$1,769	$240	$2,280	$346
Medicare Advantage Overall	$1,780	$414	$2,008	$503	$2,286	$588
CT Medicaid	$3,440	$322	$3,148	$248	$3,294	$249

Table 2: Provider Payments per Person with Utilization (Inpatient Non-Acute Care)						
	2021		**2022**		**2023**	
Inpatient Non-Acute Care (Average per Stay)	Charge Amount	Paid Amount	Charge Amount	Paid Amount	Charge Amount	Paid Amount
Aetna	$1,442	$430	$1,311	$357	$1,818	$494
Anthem	$1,042	$350	$1,423	$367	$1,464	$338
Cigna	$1,074	$233	$1,357	$234	$1,297	$204
Connecticare	$1,485	$355	$1,636	$340	$1,515	$349
Harvard Pilgrim Health Care	$347	$156	$781	$410	$441	$68
Tufts Health Plan	$466	$163	$690	$267	$1,204	$257
United Healthcare	$6,665	$577	$6,912	$634	$2,883	$863
WellCare Health Plans Inc	$2,056	$177	$2,003	$249	$1,890	$288
Medicare Advantage Overall	$2,235	$356	$2,438	$400	$1,634	$405
CT Medicaid	$2,483	$942	$2,740	$971	$3,087	$1,158

Table 3: Provider Payments per Person with Utilization (Hospice)						
	2021		**2022**		**2023**	
Hospice (Average per Visit)	Charge Amount	Paid Amount	Charge Amount	Paid Amount	Charge Amount	Paid Amount
Aetna	$183	$257	$403	$1,216	$125	$544
Anthem	$186	$75	$624	$186	$271	$119
Cigna	$279	$17	$489	$78	$310	$103
Connecticare	$235	$86	$181	$86	$186	$80
Harvard Pilgrim Health Care	$242	$0	$148	$0	$161	$105
Tufts Health Plan	$634	$484	$1,316	$854	$1,835	$1,215
United Healthcare	$319	$125	$253	$91	$275	$168
WellCare Health Plans Inc	$239	$154	$318	$455	$98	$763
Medicare Advantage Overall	$290	$150	$467	$371	$408	$387
CT Medicaid	$255	$185	$281	$210	$347	$194

Table 4: Provider Payments per Person with Utilization (Home Health)						
	2021		**2022**		**2023**	
Home Health (Average per Visit)	Charge Amount	Paid Amount	Charge Amount	Paid Amount	Charge Amount	Paid Amount
Aetna	$1,253	$214	$1,163	$505	$1,427	$500
Anthem	$1,336	$410	$1,490	$335	$1,432	$356
Cigna	$104	$46	$184	$153	$34	$18
Connecticare	$1,524	$281	$1,768	$510	$1,636	$292
Harvard Pilgrim Health Care	$798	$454	$205	$61	$311	$99
Tufts Health Plan	$708	$165	$658	$247	$1,042	$295
United Healthcare	$1,555	$353	$1,579	$315	$1,923	$393
WellCare Health Plans Inc	$1,099	$123	$1,698	$151	$1,410	$282
Medicare Advantage Overall	$1,121	$267	$1,167	$298	$1,279	$313
CT Medicaid	$1,745	$309	$1,379	$367	$1,847	$355

Table 5: Provider Payments per Person with Utilization (Emergency Department)						
	2021		**2022**		**2023**	
Emergency Department (Average per Visit)	Charge Amount	Paid Amount	Charge Amount	Paid Amount	Charge Amount	Paid Amount
Aetna	$1,215	$360	$1,194	$399	$1,704	$521
Anthem	$1,024	$396	$1,287	$358	$1,324	$364
Cigna	$994	$330	$988	$326	$1,028	$302
Connecticare	$1,304	$376	$1,338	$341	$1,465	$399
Harvard Pilgrim Health Care	$509	$140	$781	$279	$1,042	$507
Tufts Health Plan	$1,197	$321	$744	$184	$1,300	$279
United Healthcare	$1,833	$416	$2,000	$420	$2,331	$513
WellCare Health Plans Inc	$1,223	$205	$1,222	$187	$1,790	$300
Medicare Advantage Overall	$1,190	$332	$1,215	$323	$1,522	$410
CT Medicaid	$1,918	$195	$2,100	$228	$2,478	$261

Table 6: Provider Payments per Person with Utilization (Outpatient Consultations)						
	2021		**2022**		**2023**	
Outpatient Consultations (Average per Visit)	Charge Amount	Paid Amount	Charge Amount	Paid Amount	Charge Amount	Paid Amount
Aetna	$1,432	$375	$1,734	$477	$2,245	$775
Anthem	$1,703	$590	$1,763	$533	$1,438	$335
Cigna	$1,087	$200	$1,190	$388	$1,629	$502
Connecticare	$1,239	$289	$1,200	$280	$1,405	$334
Harvard Pilgrim Health Care	$1,115	$129	$1,188	$631	$346	$31
Tufts Health Plan	$766	$192	$937	$186	$1,294	$251
United Healthcare	$2,152	$444	$2,473	$515	$2,475	$574
WellCare Health Plans Inc	$2,630	$60	$1,536	$126	$1,475	$107
Medicare Advantage Overall	$1,539	$293	$1,526	$404	$1,565	$378
CT Medicaid	$2,081	$216	$2,046	$188	$2,087	$164

Table 7: Provider Payments per Person with Utilization (Psychiatric Care)						
	2021		**2022**		**2023**	
Psychiatric Care (Average per Visit)	Charge Amount	Paid Amount	Charge Amount	Paid Amount	Charge Amount	Paid Amount
Aetna	$1,486	$380	$1,643	$440	$1,820	$570
Anthem	$1,280	$463	$1,496	$394	$1,761	$452
Cigna	$919	$226	$1,227	$256	$1,309	$305
Connecticare	$1,459	$427	$1,642	$401	$1,612	$439
Harvard Pilgrim Health Care	$647	$241	$1,096	$176	$519	$40
Tufts Health Plan	$793	$180	$994	$316	$1,337	$319
United Healthcare	$2,177	$445	$2,423	$492	$2,574	$518
WellCare Health Plans Inc	$1,349	$188	$1,308	$133	$1,395	$255
Medicare Advantage Overall	$1,290	$327	$1,507	$336	$1,576	$376
CT Medicaid	$2,755	$203	$2,725	$196	$2,917	$176

Table 8: Provider Payments per Person with Utilization (Physical Therapy)						
	2021		**2022**		**2023**	
Physical Therapy (Average per Visit)	Charge Amount	Paid Amount	Charge Amount	Paid Amount	Charge Amount	Paid Amount
Aetna	$864	$254	$897	$277	$980	$308
Anthem	$832	$244	$877	$227	$949	$237
Cigna	$565	$99	$614	$157	$1,150	$514
Connecticare	$799	$259	$755	$253	$874	$327
Harvard Pilgrim Health Care	$896	$512	$439	$154	$278	$10
Tufts Health Plan	$562	$176	$744	$232	$612	$135
United Healthcare	$1,096	$220	$1,297	$300	$1,476	$296
WellCare Health Plans Inc	$1,111	$80	$749	$123	$1,037	$116
Medicare Advantage Overall	$865	$242	$840	$232	$984	$278
CT Medicaid	$1,733	$438	$1,801	$305	$1,704	$210

Table 9: Provider Payments per Person with Utilization (Imaging)						
	2021		**2022**		**2023**	
Imaging - Standard & Advanced (Average per Visit)	Charge Amount	Paid Amount	Charge Amount	Paid Amount	Charge Amount	Paid Amount
Aetna	$1,067	$434	$1,059	$420	$1,714	$730
Anthem	$1,004	$409	$1,311	$444	$1,244	$345
Cigna	$794	$248	$1,038	$317	$969	$255
Connecticare	$963	$283	$1,181	$414	$1,375	$483
Harvard Pilgrim Health Care	$503	$122	$1,204	$588	$1,691	$907
Tufts Health Plan	$585	$77	$727	$123	$1,051	$190
United Healthcare	$1,662	$461	$1,837	$454	$1,873	$460
WellCare Health Plans Inc	$850	$128	$816	$204	$1,688	$170
Medicare Advantage Overall	$960	$285	$1,188	$394	$1,500	$470
CT Medicaid	$2,929	$429	$1,739	$215	$2,869	$961

Table 10: Provider Payments per Person with Utilization (Oncology)						
	2021		**2022**		**2023**	
Oncology & Chemotherapy (Average per Visit)	Charge Amount	Paid Amount	Charge Amount	Paid Amount	Charge Amount	Paid Amount
Aetna	$2,616	$1,782	$2,997	$2,232	$3,749	$2,384
Anthem	$2,345	$1,202	$2,870	$1,409	$2,560	$1,191
Cigna	$2,386	$1,284	$3,332	$2,238	$5,976	$4,500
Connecticare	$2,139	$1,137	$1,800	$945	$2,684	$1,569
Harvard Pilgrim Health Care	$4,633	$2,060	$3,846	$1,426	$6,924	$56
Tufts Health Plan	$3,459	$2,156	$1,369	$408	$2,664	$886
United Healthcare	$3,491	$1,414	$3,768	$1,517	$4,181	$1,621
WellCare Health Plans Inc	$839	$121	$995	$182	$1,359	$303
Medicare Advantage Overall	$3,000	$1,563	$2,854	$1,445	$4,129	$1,751
CT Medicaid	$2,053	$232	$2,334	$404	$2,385	$489

Table 11: Provider Payments per Person with Utilization (Dialysis)						
	2021		**2022**		**2023**	
Dialysis (Average per Visit)	Charge Amount	Paid Amount	Charge Amount	Paid Amount	Charge Amount	Paid Amount
Aetna	$1,369	$220	$2,629	$263	$1,709	$421
Anthem	$991	$230	$1,450	$240	$1,746	$223
Cigna	$1,390	$69	$1,442	$316	$1,566	$213
Connecticare	$1,856	$466	$1,751	$191	$1,780	$257
Harvard Pilgrim Health Care	$1,449	$55	$1,941	$314	$4,420	$49
Tufts Health Plan	$535	$47	$535	$93	$948	$173
United Healthcare	$2,383	$396	$2,497	$320	$2,422	$319
WellCare Health Plans Inc	$1,761	$417	$2,807	$80	$2,971	$81
Medicare Advantage Overall	$1,496	$258	$1,921	$234	$2,206	$221
CT Medicaid	$1,659	$109	$1,891	$98	$2,560	$127

Table 12: Provider Payments per Person with Utilization (Chiropractic Care)						
	2021		**2022**		**2023**	
Chiropractic Care (Average per Visit)	Charge Amount	Paid Amount	Charge Amount	Paid Amount	Charge Amount	Paid Amount
Aetna	$620	$177	$681	$243	$1,068	$455
Anthem	$457	$164	$531	$150	$676	$196
Cigna	$401	$58	$484	$61	$535	$69
Connecticare	$1,403	$772	$2,051	$1,403	$587	$143
Harvard Pilgrim Health Care	$442	$47	$642	$194	$196	$0
Tufts Health Plan	$784	$276	$861	$358	$797	$193
United Healthcare	$1,002	$266	$1,113	$276	$1,065	$248
WellCare Health Plans Inc	$674	$207	$666	$138	$906	$535
Medicare Advantage Overall	$740	$259	$913	$377	$764	$250
CT Medicaid	$917	$108	$872	$72	$954	$91

Table 13: Provider Payments per Person with Utilization (Telehealth)						
	2021		**2022**		**2023**	
Telehealth (Average per Visit)	Charge Amount	Paid Amount	Charge Amount	Paid Amount	Charge Amount	Paid Amount
Aetna	$1,975	$499	$1,936	$478	$2,108	$753
Anthem	$1,491	$609	$1,916	$531	$2,470	$752
Cigna	$997	$308	$1,426	$520	$1,720	$523
Connecticare	$1,742	$610	$2,199	$666	$1,946	$732
Harvard Pilgrim Health Care	$347	$93	$909	$466	$652	$104
Tufts Health Plan	$733	$147	$1,003	$367	$1,253	$286
United Healthcare	$3,303	$738	$3,036	$674	$3,041	$694
WellCare Health Plans Inc	$1,155	$135	$1,309	$263	$1,825	$304
Medicare Advantage Overall	$1,495	$405	$1,746	$513	$1,913	$538
CT Medicaid	$2,669	$222	$3,470	$277	$3,311	$273

Table 14: Provider Payments per Person with Utilization (Durable Medical Equipment)						
	2021		**2022**		**2023**	
Durable Medical Equipment (Average per Order)	Charge Amount	Paid Amount	Charge Amount	Paid Amount	Charge Amount	Paid Amount
Aetna	$870	$298	$1,128	$406	$1,087	$377
Anthem	$927	$338	$1,178	$283	$1,358	$328
Cigna	$823	$226	$904	$243	$916	$315
Connecticare	$1,384	$459	$1,121	$411	$1,259	$419
Harvard Pilgrim Health Care	$2,688	$1,224	$1,732	$778	$257	$17
Tufts Health Plan	$1,547	$635	$918	$341	$1,214	$369
United Healthcare	$1,544	$291	$1,663	$375	$1,762	$346
WellCare Health Plans Inc	$721	$152	$754	$165	$829	$176
Medicare Advantage Overall	$1,352	$484	$1,198	$396	$1,082	$313
CT Medicaid	$1,432	$157	$1,946	$169	$1,541	$183

APPENDIX A5: Medicare medical claim utilization management by payer

(sourced from APCD Medical Claims)

The analysis highlights significant variability in the use of utilization management approaches across insurers and services. Aetna exhibits increasing reliance on prior authorizations and referrals, particularly for services like telehealth and durable medical equipment. Anthem maintains minimal authorization requirements across most services but shows moderate increases in referral requirements, especially for emergency department visits.. United Healthcare consistently reports lower-than-average referral and authorization requirements but higher denial rates, particularly in psychiatric care and telehealth.

Connecticare consistently demonstrates the highest referral rates across services, approaching 100% for inpatient care, chiropractic care, and imaging. Harvard Pilgrim Health Care exhibits variability in all categories, with increasing claim denial rates for services such as home health and psychiatric care. WellCare Health Plans shows steady increases in authorization requirements for services like telehealth but has the lowest referral rates for many services, such as home health.

Table 1: Use of Utilization Management by Medicare Advantage Plans (Inpatient Acute Care)									
	Authorization Needed			**Referral Needed**			**Denied Claim**		
	2021	**2022**	**2023**	**2021**	**2022**	**2023**	**2021**	**2022**	**2023**
Inpatient Acute Care									
Aetna	1%	7%	8%	7%	18%	20%	36%	36%	38%
Anthem	0%	0%	N/A	3%	8%	N/A	7%	7%	N/A
Cigna	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Connecticare	16%	17%	16%	99%	99%	100%	2%	2%	2%
Harvard Pilgrim Health Care	6%	8%	9%	5%	6%	10%	26%	31%	39%
Tufts Health Plan	7%	6%	7%	1%	0%	0%	32%	33%	36%
United Healthcare	0%	N/A	N/A	2%	N/A	N/A	32%	N/A	N/A
WellCare Health Plans Inc	21%	22%	25%	5%	4%	0%	38%	37%	39%
Medicare Advantage Overall	7%	10%	13%	17%	22%	26%	25%	24%	31%
CT Medicaid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 2: Use of Utilization Management by Medicare Advantage Plans (Inpatient Non-Acute Care)									
	Authorization Needed			**Referral Needed**			**Denied Claim**		
	2021	**2022**	**2023**	**2021**	**2022**	**2023**	**2021**	**2022**	**2023**
Inpatient Non-Acute Care									
Aetna	1%	8%	8%	2%	11%	15%	35%	35%	38%
Anthem	0%	0%	N/A	1%	6%	N/A	9%	8%	N/A
Cigna	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Connecticare	10%	11%	11%	99%	99%	100%	2%	2%	2%
Harvard Pilgrim Health Care	6%	7%	7%	4%	4%	14%	23%	30%	50%
Tufts Health Plan	N/A	3%	7%	N/A	0%	1%	N/A	32%	37%
United Healthcare	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WellCare Health Plans Inc	27%	29%	28%	2%	3%	2%	37%	38%	39%
Medicare Advantage Overall	9%	10%	12%	21%	20%	26%	21%	24%	33%
CT Medicaid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 3: Use of Utilization Management by Medicare Advantage Plans (Hospice)									
	Authorization Needed			**Referral Needed**			**Denied Claim**		
	2021	**2022**	**2023**	**2021**	**2022**	**2023**	**2021**	**2022**	**2023**
Hospice									
Aetna	N/A	0%	0%	N/A	28%	31%	N/A	36%	43%
Anthem	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cigna	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Connecticare	97%	97%	97%	100%	100%	100%	25%	23%	23%
Harvard Pilgrim Health Care	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tufts Health Plan	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
United Healthcare	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WellCare Health Plans Inc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Medicare Advantage Overall	97%	48%	48%	100%	64%	65%	25%	30%	33%
CT Medicaid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 4: Use of Utilization Management by Medicare Advantage Plans (Home Health)									
	Authorization Needed			**Referral Needed**			**Denied Claim**		
	2021	**2022**	**2023**	**2021**	**2022**	**2023**	**2021**	**2022**	**2023**
Home Health									
Aetna	0%	2%	3%	10%	17%	21%	29%	29%	30%
Anthem	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cigna	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Connecticare	51%	53%	49%	99%	99%	100%	12%	12%	11%
Harvard Pilgrim Health Care	N/A	18%	N/A	N/A	36%	N/A	N/A	52%	N/A
Tufts Health Plan	7%	N/A	N/A	2%	N/A	N/A	38%	N/A	N/A
United Healthcare	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WellCare Health Plans Inc	28%	23%	14%	2%	2%	0%	36%	33%	25%
Medicare Advantage Overall	22%	24%	22%	28%	39%	40%	29%	31%	22%
CT Medicaid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 5: Use of Utilization Management by Medicare Advantage Plans (Emergency Department)									
	Authorization Needed			**Referral Needed**			**Denied Claim**		
	2021	**2022**	**2023**	**2021**	**2022**	**2023**	**2021**	**2022**	**2023**
Emergency Department									
Aetna	0%	3%	3%	24%	43%	40%	24%	22%	27%
Anthem	0%	0%	N/A	17%	19%	N/A	6%	6%	N/A
Cigna	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Connecticare	14%	14%	14%	99%	99%	100%	2%	2%	3%
Harvard Pilgrim Health Care	4%	5%	6%	21%	20%	25%	22%	24%	37%
Tufts Health Plan	3%	3%	3%	1%	0%	0%	27%	30%	32%
United Healthcare	0%	0%	0%	1%	0%	0%	26%	28%	28%
WellCare Health Plans Inc	13%	13%	14%	4%	4%	1%	22%	24%	23%
Medicare Advantage Overall	5%	5%	7%	24%	27%	28%	19%	20%	25%
CT Medicaid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 6: Use of Utilization Management by Medicare Advantage Plans (Outpatient Consultations)

	Authorization Needed			Referral Needed			Denied Claim		
	2021	**2022**	**2023**	**2021**	**2022**	**2023**	**2021**	**2022**	**2023**
Outpatient Consultations									
Aetna	0%	4%	4%	8%	21%	25%	35%	30%	38%
Anthem	0%	0%	N/A	6%	11%	N/A	9%	9%	N/A
Cigna	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Connecticare	11%	12%	11%	98%	99%	100%	2%	2%	3%
Harvard Pilgrim Health Care	6%	7%	15%	10%	7%	11%	24%	26%	35%
Tufts Health Plan	4%	3%	4%	2%	1%	0%	27%	27%	31%
United Healthcare	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WellCare Health Plans Inc	12%	12%	8%	1%	0%	1%	31%	33%	28%
Medicare Advantage Overall	6%	6%	9%	21%	23%	27%	21%	21%	27%
CT Medicaid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 7: Use of Utilization Management by Medicare Advantage Plans (Psychiatric Care)									
	Authorization Needed			**Referral Needed**			**Denied Claim**		
	2021	**2022**	**2023**	**2021**	**2022**	**2023**	**2021**	**2022**	**2023**
Psychiatric Care									
Aetna	1%	5%	4%	22%	31%	38%	28%	31%	30%
Anthem	0%	0%	N/A	14%	18%	N/A	8%	9%	N/A
Cigna	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Connecticare	13%	13%	13%	99%	99%	100%	3%	5%	5%
Harvard Pilgrim Health Care	4%	5%	4%	25%	21%	22%	23%	26%	40%
Tufts Health Plan	4%	4%	4%	1%	0%	0%	26%	29%	27%
United Healthcare	0%	N/A	N/A	1%	N/A	N/A	27%	N/A	N/A
WellCare Health Plans Inc	11%	11%	13%	3%	3%	1%	23%	27%	27%
Medicare Advantage Overall	5%	6%	8%	24%	29%	32%	20%	21%	26%
CT Medicaid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 8: Use of Utilization Management by Medicare Advantage Plans (Physical Therapy)									
	Authorization Needed			**Referral Needed**			**Denied Claim**		
	2021	**2022**	**2023**	**2021**	**2022**	**2023**	**2021**	**2022**	**2023**
Physical Therapy									
Aetna	0%	3%	2%	45%	39%	68%	11%	16%	16%
Anthem	0%	0%	N/A	42%	40%	N/A	4%	9%	N/A
Cigna	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Connecticare	12%	12%	10%	100%	100%	100%	2%	6%	9%
Harvard Pilgrim Health Care	3%	3%	5%	46%	39%	42%	24%	28%	36%
Tufts Health Plan	N/A	3%	3%	N/A	2%	1%	N/A	19%	20%
United Healthcare	N/A	0%	N/A	N/A	0%	N/A	N/A	32%	N/A
WellCare Health Plans Inc	11%	10%	11%	2%	2%	1%	15%	23%	22%
Medicare Advantage Overall	5%	4%	6%	47%	32%	42%	11%	19%	21%
CT Medicaid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 9: Use of Utilization Management by Medicare Advantage Plans (Imaging)									
	Authorization Needed			**Referral Needed**			**Denied Claim**		
	2021	**2022**	**2023**	**2021**	**2022**	**2023**	**2021**	**2022**	**2023**
Imaging (Standard & Advanced)									
Aetna	0%	2%	2%	38%	65%	57%	18%	15%	22%
Anthem	0%	0%	N/A	35%	32%	N/A	5%	7%	N/A
Cigna	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Connecticare	18%	18%	18%	99%	100%	100%	3%	3%	4%
Harvard Pilgrim Health Care	4%	4%	7%	39%	37%	36%	18%	22%	33%
Tufts Health Plan	2%	2%	1%	0%	0%	0%	17%	20%	22%
United Healthcare	0%	0%	0%	0%	0%	0%	20%	23%	23%
WellCare Health Plans Inc	12%	13%	14%	2%	1%	1%	16%	18%	18%
Medicare Advantage Overall	5%	6%	7%	31%	34%	32%	14%	15%	20%
CT Medicaid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 10: Use of Utilization Management by Medicare Advantage Plans (Oncology)									
	Authorization Needed			**Referral Needed**			**Denied Claim**		
	2021	**2022**	**2023**	**2021**	**2022**	**2023**	**2021**	**2022**	**2023**
Oncology & Chemotherapy									
Aetna	0%	3%	3%	33%	53%	53%	17%	18%	22%
Anthem	0%	0%	N/A	27%	27%	N/A	5%	9%	N/A
Cigna	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Connecticare	18%	18%	17%	99%	100%	100%	2%	7%	7%
Harvard Pilgrim Health Care	5%	5%	7%	25%	27%	31%	18%	22%	36%
Tufts Health Plan	7%	6%	7%	0%	0%	0%	23%	24%	27%
United Healthcare	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WellCare Health Plans Inc	9%	8%	9%	2%	2%	2%	15%	22%	19%
Medicare Advantage Overall	7%	7%	9%	31%	35%	37%	13%	17%	22%
CT Medicaid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 11: Use of Utilization Management by Medicare Advantage Plans (Dialysis)									
	Authorization Needed			**Referral Needed**			**Denied Claim**		
	2021	**2022**	**2023**	**2021**	**2022**	**2023**	**2021**	**2022**	**2023**
Dialysis									
Aetna	0%	2%	5%	1%	6%	14%	33%	41%	42%
Anthem	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cigna	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Connecticare	8%	8%	9%	99%	99%	100%	0%	1%	1%
Harvard Pilgrim Health Care	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tufts Health Plan	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
United Healthcare	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WellCare Health Plans Inc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Medicare Advantage Overall	4%	5%	7%	50%	53%	57%	17%	21%	22%
CT Medicaid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 12: Use of Utilization Management by Medicare Advantage Plans (Chiropractic Care)									
	Authorization Needed			**Referral Needed**			**Denied Claim**		
	2021	**2022**	**2023**	**2021**	**2022**	**2023**	**2021**	**2022**	**2023**
Chiropractic Care									
Aetna	0%	3%	3%	48%	35%	43%	20%	25%	20%
Anthem	0%	0%	N/A	22%	29%	N/A	6%	8%	N/A
Cigna	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Connecticare	8%	8%	7%	99%	99%	100%	2%	2%	3%
Harvard Pilgrim Health Care	10%	10%	12%	17%	20%	12%	21%	30%	23%
Tufts Health Plan	N/A	N/A	8%	N/A	N/A	0%	N/A	N/A	30%
United Healthcare	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WellCare Health Plans Inc	12%	13%	13%	1%	0%	0%	39%	40%	41%
Medicare Advantage Overall	6%	7%	9%	37%	37%	31%	18%	21%	23%
CT Medicaid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 13: Use of Utilization Management by Medicare Advantage Plans (Telehealth)									
	Authorization Needed			**Referral Needed**			**Denied Claim**		
	2021	**2022**	**2023**	**2021**	**2022**	**2023**	**2021**	**2022**	**2023**
Telehealth									
Aetna	1%	7%	9%	20%	56%	48%	32%	25%	33%
Anthem	0%	N/A	N/A	17%	N/A	N/A	6%	N/A	N/A
Cigna	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Connecticare	23%	24%	25%	99%	100%	100%	6%	5%	4%
Harvard Pilgrim Health Care	9%	12%	23%	20%	20%	27%	17%	27%	36%
Tufts Health Plan	N/A	1%	4%	N/A	1%	1%	N/A	29%	29%
United Healthcare	0%	0%	0%	1%	1%	1%	29%	29%	33%
WellCare Health Plans Inc	8%	9%	13%	2%	1%	0%	30%	28%	28%
Medicare Advantage Overall	7%	9%	12%	27%	30%	30%	20%	24%	27%
CT Medicaid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 14: Use of Utilization Management by Medicare Advantage Plans (Durable Medical Equipment)

	Authorization Needed			Referral Needed			Denied Claim		
	2021	**2022**	**2023**	**2021**	**2022**	**2023**	**2021**	**2022**	**2023**
Durable Medical Equipment									
Aetna	1%	4%	3%	58%	56%	68%	11%	15%	15%
Anthem	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cigna	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Connecticare	14%	13%	12%	100%	100%	100%	4%	6%	10%
Harvard Pilgrim Health Care	7%	10%	17%	49%	43%	43%	22%	26%	38%
Tufts Health Plan	3%	3%	3%	1%	0%	0%	18%	23%	27%
United Healthcare	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WellCare Health Plans Inc	9%	8%	10%	1%	1%	0%	15%	18%	20%
Medicare Advantage Overall	7%	8%	9%	42%	40%	42%	14%	17%	22%
CT Medicaid	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

APPENDIX A6: Medicare pharmacy claims, payments, and utilization management by payer

(sourced from APCD Pharmacy Claims)

The analysis of pharmacy claims reveals notable differences in utilization, cost, and management approaches across insurers. Generic prescriptions dominate across insurers, with Tufts Health Plan leading in generic use, while Harvard Pilgrim Health Care consistently has the lowest proportion of generic prescriptions. Cigna and Harvard Pilgrim Health Care reporting the highest refill rates across years.

Pharmacy costs vary significantly, with United Healthcare reporting the highest average charge amounts for prescriptions. Utilization management trends show Connecticare and Harvard Pilgrim Health Care requiring prior authorization most frequently, with decreasing rates over time. Claim denial rates are highest for Harvard Pilgrim Health Care but a downward trend in denials was observed.

Table 1. Pharmacy Claims per Person with Utilization (Average Number of Prescriptions)			
	2021	**2022**	**2023**
Average Number of Prescriptions			
Aetna	8	8	9
Anthem	11	13	10
Cigna	10	10	8
Connecticare	9	8	9
Harvard Pilgrim Health Care	9	14	10
Tufts Health Plan	10	9	9
United Healthcare	9	9	9
WellCare Health Plans Inc	N/A	N/A	N/A
Medicare Advantage Overall	9	10	9
CT Medicaid	10	10	12

Table 2. Pharmacy Claims per Person with Utilization (Proportion of Generic Prescriptions)			
	2021	**2022**	**2023**
Proportion of Generic Prescriptions			
Aetna	89%	88%	85%
Anthem	88%	88%	85%
Cigna	89%	82%	87%
Connecticare	90%	89%	86%
Harvard Pilgrim Health Care	86%	84%	80%
Tufts Health Plan	91%	89%	86%
United Healthcare	88%	86%	86%
WellCare Health Plans Inc	N/A	N/A	N/A
Medicare Advantage Overall	89%	86%	85%
CT Medicaid	85%	86%	85%

Table 3. Pharmacy Claims per Person with Utilization (Proportion of Refill Prescriptions)			
	2021	**2022**	**2023**
Proportion of Refill Prescriptions			
Aetna	44%	42%	41%
Anthem	44%	41%	42%
Cigna	49%	48%	45%
Connecticare	46%	42%	44%
Harvard Pilgrim Health Care	49%	40%	46%
Tufts Health Plan	42%	41%	40%
United Healthcare	42%	40%	39%
WellCare Health Plans Inc	N/A	N/A	N/A
Medicare Advantage Overall	46%	44%	44%
CT Medicaid	47%	43%	44%

Table 4: Pharmacy Payments per Person with Utilization (Prescription Average Total Cost)						
	2021		**2022**		**2023**	
Prescription Average Total Cost	Charge Amount	Paid Amount	Charge Amount	Paid Amount	Charge Amount	Paid Amount
Aetna	$3,599	$3,349	$5,720	$5,273	$5,505	$4,869
Anthem	$4,069	$1,962	$3,566	$1,836	$3,354	$1,754
Cigna	$3,692	$1,894	$4,845	$3,086	$7,931	$5,556
Connecticare	$3,039	$2,559	$3,852	$3,329	$3,085	$2,677
Harvard Pilgrim Health Care	$8,293	$3,410	$6,657	$2,650	$8,966	$859
Tufts Health Plan	$4,944	$2,699	$2,647	$658	$3,946	$1,360
United Healthcare	$13,443	$4,134	$14,925	$4,820	$6,798	$3,328
Medicare Advantage Overall	$5,868	$2,858	$6,030	$3,093	$5,655	$2,915
CT Medicaid	$5,469	$1,386	$2,673	$971	$4,523	$2,216

Table 5: Use of Utilization Management by Medicare Advantage Plans (Prescriptions)						
	Authorization Needed			**Denied Claim**		
	2021	**2022**	**2023**	**2021**	**2022**	**2023**
Pharmacy Prescriptions	N/A	N/A	N/A	N/A	N/A	N/A
Aetna	N/A	3%	N/A	N/A	11%	11%
Anthem	N/A	N/A	N/A	N/A	N/A	N/A
Cigna	N/A	N/A	N/A	N/A	N/A	N/A
Connecticare	26%	23%	22%	3%	5%	5%
Harvard Pilgrim Health Care	20%	17%	10%	25%	25%	10%
Tufts Health Plan	N/A	N/A	N/A	N/A	N/A	N/A
United Healthcare	N/A	N/A	N/A	N/A	N/A	N/A
WellCare Health Plans Inc	N/A	N/A	N/A	N/A	N/A	N/A
Medicare Advantage Overall	23%	14%	11%	14%	14%	9%
CT Medicaid	N/A	N/A	N/A	N/A	N/A	N/A

APPENDIX A7: Analysis of Variance (ANOVA) results for Utilization Management by payer and service provider

(sourced from APCD Medical Claims)

The ANOVA analysis revealed predictors of utilization management approaches, including prior authorizations, claim denials, and referral requirements. For prior authorizations, the strongest predictors were average charge amount, insurer, amount paid, and provider type, with services like hospice care, dialysis, telehealth, and imaging consistently requiring prior authorization across payers. In contrast, outpatient consultations and physical therapy showed less consistent requirements. Provider type and average number of visits were consistently significant, while charge amount and paid amount varied, with insurers such as Cigna and Anthem demonstrating strong associations, whereas United Healthcare and Harvard Pilgrim showed minimal impact.

For referrals, provider type and average number of visits remained consistent predictors, while charge amount and paid amount showed variability across payers. Emergency Department, medical equipment, imaging, oncology, and inpatient non-acute care were strongly associated with referral requirements, while physical therapy showed weaker associations. Similarly, claim denials were significantly influenced by provider type and average number of visits, though average charge amount and paid amount varied. Anthem and Connecticare showed strong associations for charge amounts, while United Healthcare, Cigna, and Tufts Health Plan denials were associated with paid amounts. High denial rates were observed for services such as emergency department, home health, hospice, and imaging, while telehealth and prescription medicines experienced fewer denials.

Table 1. Prior Authorization ANOVA results (Medicare Advantage Overall)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Average_Charge_Amount	1	79.5119	79.5119	2224.303	0.0000
Average_Paid_Amount	1	32.4307	32.4307	907.233	0.0000
Avg_Visits	1	5.7564	5.7564	161.031	0.0000
Provider.Type	14	193.1521	13.7966	385.952	0.0000
payer_name.x	8	470.0238	58.7530	1643.584	0.0000
year	2	0.3962	0.1981	5.542	0.0039
gender_code	2	2.9302	1.4651	40.985	0.0000
marital_status_code	6	100.5840	16.7640	468.964	0.0000
employment_status_code	3	24.4442	8.1481	227.937	0.0000
Disab	1	45.5338	45.5338	1273.784	0.0000
age	1	36.4468	36.4468	1019.581	0.0000

Table 2. Prior Authorization ANOVA results (Cigna)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	61.815	4.415	112.288	0.000
year	2	0.131	0.065	1.660	0.190
gender_code	2	1.283	0.642	16.317	0.000
marital_status_code	4	50.416	12.604	320.536	0.000
employment_status_code	2	11.594	5.797	147.429	0.000
Disab	1	1.122	1.122	28.524	0.000
age	1	15.269	15.269	388.323	0.000
Avg_Visits	1	13.472	13.472	342.621	0.000
Average_Charge_Amount	1	20.211	20.211	513.991	0.000
Average_Paid_Amount	1	1.107	1.107	28.161	0.000
Residuals	4844	190.473	0.039		

Table 3. Prior Authorization ANOVA results (Aetna)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	1.863	0.133	13.040	0.000
year	2	0.086	0.043	4.229	0.015
gender_code	1	0.268	0.268	26.226	0.000
employment_status_code	1	6.144	6.144	602.226	0.000
age	1	2.418	2.418	236.984	0.000
Avg_Visits	1	0.002	0.002	0.150	0.699
Average_Paid_Amount	1	1.118	1.118	109.618	0.000
Residuals	2622	26.752	0.010		

Table 4. Prior Authorization ANOVA results (Anthem)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	24.191	1.728	117.448	0.000
year	2	1.323	0.661	44.946	0.000
gender_code	1	0.001	0.001	0.064	0.801
marital_status_code	1	0.491	0.491	33.342	0.000
employment_status_code	3	15.553	5.184	352.369	0.000
age	1	5.218	5.218	354.688	0.000
Avg_Visits	1	1.116	1.116	75.822	0.000
Average_Charge_Amount	1	1.093	1.093	74.269	0.000
Average_Paid_Amount	1	0.086	0.086	5.866	0.015
Residuals	3498	51.464	0.015		

Table 5. Prior Authorization ANOVA results (United HealthCare)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	1.191	0.085	4.525	0.000
year	2	0.056	0.028	1.495	0.224
gender_code	1	0.019	0.019	0.999	0.318
marital_status_code	5	58.079	11.616	618.116	0.000
employment_status_code	2	15.978	7.989	425.126	0.000
age	1	0.080	0.080	4.255	0.039
Avg_Visits	1	4.649	4.649	247.398	0.000
Average_Charge_Amount	1	2.517	2.517	133.932	0.000
Average_Paid_Amount	1	0.022	0.022	1.182	0.277
Residuals	2907	54.629	0.019		

Table 6. Prior Authorization ANOVA results (Connecticare)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	1.191	0.085	4.525	0.000
year	2	0.056	0.028	1.495	0.224
gender_code	1	0.019	0.019	0.999	0.318
marital_status_code	5	58.079	11.616	618.116	0.000
employment_status_code	2	15.978	7.989	425.126	0.000
age	1	0.080	0.080	4.255	0.039
Avg_Visits	1	4.649	4.649	247.398	0.000
Average_Charge_Amount	1	2.517	2.517	133.932	0.000
Average_Paid_Amount	1	0.022	0.022	1.182	0.277
Residuals	2907	54.629	0.019		

Table 7. Prior Authorization ANOVA results (Harvard Pilgrim Health Care)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	14.051	1.004	19.578	0.000
year	2	0.148	0.074	1.447	0.236
gender_code	1	0.002	0.002	0.037	0.847
age	1	7.814	7.814	152.425	0.000
Avg_Visits	1	3.261	3.261	63.609	0.000
Residuals	702	35.988	0.051		

Table 8. Prior Authorization ANOVA results (Tufts Health Plan)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	29.184	2.085	96.396	0.000
year	2	1.147	0.573	26.509	0.000
gender_code	1	0.167	0.167	7.727	0.005
age	1	19.109	19.109	883.685	0.000
Avg_Visits	1	2.211	2.211	102.254	0.000
Residuals	1804	39.011	0.022		

Table 9. Prior Authorization ANOVA results (WellCare Health Plans)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	43.098	3.078	127.607	0.000
year	2	1.167	0.584	24.189	0.000
gender_code	1	2.235	2.235	92.645	0.000
Disab	1	44.761	44.761	1855.417	0.000
age	1	13.774	13.774	570.943	0.000
Avg_Visits	1	3.647	3.647	151.194	0.000
Residuals	3280	79.128	0.024		

Table 10. Referral Required ANOVA results (Medicare Advantage Overall)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Average_Charge_Amount	1	124.384	124.384	2400.509	0.000
Average_Paid_Amount	1	99.271	99.271	1915.835	0.000
Avg_Visits	1	21.407	21.407	413.129	0.000
Provider.Type	14	121.374	8.670	167.315	0.000
payer_name.x	8	2533.617	316.702	6112.065	0.000
year	2	0.494	0.247	4.764	0.009
gender_code	3	7.535	2.512	48.470	0.000
marital_status_code	6	86.227	14.371	277.350	0.000
employment_status_code	3	199.269	66.423	1281.901	0.000
Disab	1	27.842	27.842	537.329	0.000
age	1	47.128	47.128	909.519	0.000

Table 11. Referral Required ANOVA results (Cigna)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	73.4780	5.2484	93.5606	0.000
year	2	4.1198	2.0599	36.7209	0.000
gender_code	2	0.3939	0.1969	3.5105	0.030
marital_status_code	4	179.2003	44.8001	798.6246	0.000
employment_status_code	2	23.5307	11.7654	209.7341	0.000
Disab	1	0.5112	0.5112	9.1128	0.003
age	1	53.6992	53.6992	957.2644	0.000
Avg_Visits	1	13.8779	13.8779	247.3940	0.000
Average_Charge_Amount	1	2.1238	2.1238	37.8597	0.000
Average_Paid_Amount	1	0.3888	0.3888	6.9302	0.009
Residuals	5170	290.0191	0.0561		

Table 12. Referral Required ANOVA results (Aetna)

Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	46.9215	3.3515	122.5987	0.000
year	2	9.7957	4.8979	179.1635	0.000
gender_code	1	0.0008	0.0008	0.0292	0.864
marital_status_code	1	0.3607	0.3607	13.1948	0.000
employment_status_code	2	0.2027	0.1014	3.7077	0.025
age	1	4.4301	4.4301	162.0531	0.000
Avg_Visits	1	5.2972	5.2972	193.7697	0.000
Average_Charge_Amount	1	0.0198	0.0198	0.7228	0.395
Average_Paid_Amount	1	0.0085	0.0085	0.3105	0.577
Residuals	3351	91.6077	0.0273		

Table 13. Referral Required ANOVA results (Anthem)

Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	178.4008	12.7429	512.4855	0.000
year	2	0.1645	0.0822	3.3072	0.037
gender_code	2	0.9091	0.4546	18.2810	0.000
marital_status_code	3	16.4456	5.4819	220.4659	0.000
employment_status_code	3	141.1535	47.0512	1892.2698	0.000
age	1	17.8836	17.8836	719.2286	0.000
Avg_Visits	1	10.4912	10.4912	421.9261	0.000
Average_Charge_Amount	1	0.3159	0.3159	12.7030	0.000
Average_Paid_Amount	1	1.0647	1.0647	42.8209	0.000
Residuals	7201	179.0524	0.0249		

Table 14. Referral Required ANOVA results (United HealthCare)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	48.8148	3.4868	61.2315	0.000
year	2	4.8149	2.4074	42.2773	0.000
gender_code	2	5.1909	2.5954	45.5789	0.000
marital_status_code	5	119.5059	23.9012	419.7306	0.000
employment_status_code	3	198.1575	66.0525	1159.9538	0.000
age	1	1.8086	1.8086	31.7610	0.000
Avg_Visits	1	40.5915	40.5915	712.8317	0.000
Average_Charge_Amount	1	1.2561	1.2561	22.0593	0.000
Average_Paid_Amount	1	3.9023	3.9023	68.5286	0.000
Residuals	5456	310.6869	0.0569		

Table 15. Referral Required ANOVA results (Connecticare)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	0.6669	0.0476	9.6308	0.000
year	2	1.6085	0.8042	162.6067	0.000
gender_code	1	0.0370	0.0370	7.4811	0.006
marital_status_code	5	0.9933	0.1987	40.1667	0.000
employment_status_code	2	1.6751	0.8375	169.3421	0.000
age	1	5.0565	5.0565	1022.3645	0.000
Avg_Visits	1	0.0740	0.0740	14.9689	0.000
Average_Charge_Amount	1	0.0175	0.0175	3.5315	0.060
Average_Paid_Amount	1	0.3464	0.3464	70.0466	0.000
Residuals	7485	37.0197	0.0049		

Table 16. Referral Required ANOVA results (Harvard Pilgrim Health Care)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	15.9471	1.1391	32.1577	0.000
year	2	1.7407	0.8704	24.5711	0.000
gender_code	1	0.4762	0.4762	13.4442	0.000
age	1	16.2870	16.2870	459.8024	0.000
Avg_Visits	1	4.1565	4.1565	117.3430	0.000
Residuals	992	35.1384	0.0354		

Table 17. Referral Required ANOVA results (Tufts Health Plan)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	40.3349	2.8811	90.8711	0.000
year	2	19.5632	9.7816	308.5204	0.000
gender_code	1	1.0637	1.0637	33.5501	0.000
employment_status_code	1	0.6224	0.6224	19.6296	0.000
age	1	35.0004	35.0004	1103.9401	0.000
Avg_Visits	1	4.3804	4.3804	138.1609	0.000
Average_Paid_Amount	1	0.2991	0.2991	9.4329	0.002
Residuals	1766	55.9909	0.0317		

Table 18. Referral Required ANOVA results (WellCare Health Plans)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	36.2397	2.5886	92.2985	0.000
year	2	2.2409	1.1205	39.9516	0.000
gender_code	1	0.8524	0.8524	30.3939	0.000
Disab	1	43.7232	43.7232	1559.0135	0.000
age	1	13.6289	13.6289	485.9577	0.000
Avg_Visits	1	13.3224	13.3224	475.0282	0.000
Residuals	2856	80.0978	0.0280		

Table 19. Denied Claims ANOVA results (Medicare Advantage Overall)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Average_Charge_Amount	1	33.8038	33.8038	810.224	0.00
Average_Paid_Amount	1	44.4614	44.4614	1065.670	0.00
Avg_Visits	1	167.0719	167.0719	4004.449	0.00
Provider.Type	14	59.3748	4.2411	101.651	0.00
payer_name.x	8	437.1913	54.6489	1309.848	0.00
year	2	2.7940	1.3970	33.484	0.00
gender_code	2	3.9227	1.9614	47.011	0.00
marital_status_code	6	349.2650	58.2108	1395.222	0.00
employment_status_code	3	68.3997	22.7999	546.478	0.00
Disab	1	36.2110	36.2110	867.921	0.00
age	1	39.6937	39.6937	951.396	0.00

Table 20. Denied Claims ANOVA results (Cigna)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	46.3961	3.3140	66.0838	0.000
year	2	1.0377	0.5188	10.3460	0.000
gender_code	2	2.3769	1.1884	23.6985	0.000
marital_status_code	4	73.2987	18.3247	365.4075	0.000
employment_status_code	2	9.3041	4.6520	92.7649	0.000
Disab	1	3.3285	3.3285	66.3729	0.000
age	1	24.7902	24.7902	494.3353	0.000
Avg_Visits	1	33.4035	33.4035	666.0903	0.000
Average_Charge_Amount	1	3.1894	3.1894	63.5984	0.000
Average_Paid_Amount	1	1.9044	1.9044	37.9749	0.000
Residuals	7096	355.8547	0.0501		

Table 21. Denied Claims ANOVA results (Aetna)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	1.863	0.133	13.040	0.000
year	2	0.086	0.043	4.229	0.015
gender_code	1	0.268	0.268	26.226	0.000
employment_status_code	1	6.144	6.144	602.226	0.000
age	1	2.418	2.418	236.984	0.000
Avg_Visits	1	0.002	0.002	0.150	0.699
Average_Paid_Amount	1	1.118	1.118	109.618	0.000
Residuals	2622	26.752	0.010		

Table 22. Denied Claims ANOVA results (Anthem)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	7.6423	0.5459	17.8830	0.000
year	2	1.1122	0.5561	18.2184	0.000
gender_code	2	5.8277	2.9139	95.4580	0.000
marital_status_code	4	321.7971	80.4493	2635.5226	0.000
employment_status_code	3	81.9684	27.3228	895.0964	0.000
age	1	12.0949	12.0949	396.2310	0.000
Avg_Visits	1	23.7399	23.7399	777.7194	0.000
Average_Charge_Amount	1	5.3654	5.3654	175.7711	0.000
Average_Paid_Amount	1	9.9962	9.9962	327.4765	0.000
Residuals	9654	294.6881	0.0305		

Table 23. Denied Claims ANOVA results (United HealthCare)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	38.2866	2.7348	66.1092	0.000
year	2	1.4757	0.7378	17.8364	0.000
gender_code	1	0.9666	0.9666	23.3658	0.000
marital_status_code	5	90.4977	18.0995	437.5339	0.000
employment_status_code	3	48.5312	16.1771	391.0605	0.000
age	1	1.3689	1.3689	33.0903	0.000
Avg_Visits	1	75.7613	75.7613	1831.4347	0.000
Average_Charge_Amount	1	4.8294	4.8294	116.7455	0.000
Average_Paid_Amount	1	1.8322	1.8322	44.2911	0.000
Residuals	11812	488.6293	0.0414		

Table 24. Denied Claims ANOVA results (Connecticare)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	13.4701	0.9622	34.5291	0.000
year	2	1.1146	0.5573	20.0003	0.000
gender_code	1	0.8408	0.8408	30.1730	0.000
marital_status_code	5	115.7893	23.1579	831.0766	0.000
employment_status_code	2	14.7264	7.3632	264.2464	0.000
age	1	4.1631	4.1631	149.4048	0.000
Avg_Visits	1	10.4494	10.4494	375.0008	0.000
Average_Charge_Amount	1	5.3141	5.3141	190.7080	0.000
Average_Paid_Amount	1	1.5810	1.5810	56.7363	0.000
Residuals	4852	135.2005	0.0279		

Table 25. Denied Claims ANOVA results (Harvard Pilgrim Health Care)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	6.2347	0.4453	10.7328	0.000
year	2	1.4088	0.7044	16.9764	0.000
gender_code	1	0.0665	0.0665	1.6024	0.206
age	1	6.0250	6.0250	145.2052	0.000
Avg_Visits	1	2.3965	2.3965	57.7555	0.000
Residuals	1106	45.8914	0.0415		

Table 26. Denied Claims ANOVA results (Tufts Health Plan)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	28.8030	2.0574	187.2775	0.000
year	2	0.1072	0.0536	4.8812	0.008
gender_code	1	0.0092	0.0092	0.8404	0.359
employment_status_code	2	0.6414	0.3207	29.1931	0.000
age	1	7.7088	7.7088	701.7223	0.000
Avg_Visits	1	0.8622	0.8622	78.4860	0.000
Average_Paid_Amount	1	0.8360	0.8360	76.1020	0.000
Residuals	2271	24.9483	0.0110		

Table 27. Denied Claims ANOVA results (WellCare Health Plans)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
Provider.Type	14	30.2634	2.1617	127.5671	0.000
year	2	0.7950	0.3975	23.4587	0.000
gender_code	1	0.7681	0.7681	45.3306	0.000
Disab	1	32.6542	32.6542	1927.0260	0.000
age	1	3.0222	3.0222	178.3495	0.000
Avg_Visits	1	1.7163	1.7163	101.2869	0.000
Residuals	4013	68.0018	0.0169		

Table 28. Prior Authorization by service type ANOVA results (Dialysis)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	60.973	7.6217	206.033	0.000
year	2	0.022	0.0111	0.299	0.741
gender_code	1	0.793	0.7929	21.435	0.000
marital_status_code	4	10.104	2.5261	68.286	0.000
employment_status_code	2	1.358	0.6791	18.358	0.000
Disab	1	1.752	1.7520	47.360	0.000
age	1	2.947	2.9474	79.677	0.000
Avg_Visits	1	3.541	3.5409	95.720	0.000
Average_Charge_Amount	1	0.120	0.1204	3.253	0.072
Average_Paid_Amount	1	0.297	0.2969	8.025	0.005
Residuals	1307	48.349	0.0370		

Table 29. Prior Authorization by service type ANOVA results (Emergency Department)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	21.569	2.6961	110.732	0.000
year	2	0.013	0.0064	0.264	0.768
gender_code	2	0.537	0.2683	11.018	0.000
marital_status_code	6	7.991	1.3318	54.697	0.000
employment_status_code	3	2.078	0.6927	28.449	0.000
Disab	1	4.720	4.7198	193.848	0.000
age	1	2.461	2.4606	101.059	0.000
Avg_Visits	1	2.757	2.7572	113.240	0.000
Average_Charge_Amount	1	2.369	2.3686	97.280	0.000
Average_Paid_Amount	1	0.252	0.2522	10.358	0.001
Residuals	2312	56.293	0.0243		

Table 30. Prior Authorization by service type ANOVA results (Imaging)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	32.559	4.0699	148.532	0.000
year	2	0.001	0.0007	0.024	0.976
gender_code	2	1.926	0.9629	35.142	0.000
marital_status_code	6	6.989	1.1648	42.509	0.000
employment_status_code	3	2.863	0.9543	34.829	0.000
Disab	1	4.113	4.1134	150.122	0.000
age	1	4.139	4.1389	151.052	0.000
Avg_Visits	1	4.293	4.2934	156.690	0.000
Average_Charge_Amount	1	2.284	2.2841	83.360	0.000
Average_Paid_Amount	1	0.013	0.0127	0.463	0.496
Residuals	2362	64.720	0.0274		

Table 31. Prior Authorization by service type ANOVA results (Inpatient Acute Care)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	33.840	4.2300	163.335	0.000
year	2	0.082	0.0412	1.592	0.204
gender_code	2	0.301	0.1506	5.817	0.003
marital_status_code	6	8.992	1.4986	57.867	0.000
employment_status_code	3	3.050	1.0166	39.256	0.000
Disab	1	3.081	3.0808	118.963	0.000
age	1	3.027	3.0273	116.895	0.000
Avg_Visits	1	4.449	4.4491	171.799	0.000
Average_Charge_Amount	1	4.802	4.8016	185.409	0.000
Average_Paid_Amount	1	0.393	0.3925	15.157	0.000
Residuals	2437	63.112	0.0259		

Table 32. Prior Authorization by service type ANOVA results (Inpatient Non-Acute Care)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	41.238	5.1547	163.925	0.000
year	2	0.156	0.0781	2.484	0.084
gender_code	2	0.838	0.4190	13.325	0.000
marital_status_code	6	8.843	1.4738	46.867	0.000
employment_status_code	3	1.324	0.4414	14.037	0.000
Disab	1	3.320	3.3200	105.580	0.000
age	1	3.811	3.8114	121.206	0.000
Avg_Visits	1	5.728	5.7276	182.144	0.000
Average_Charge_Amount	1	5.131	5.1312	163.176	0.000
Average_Paid_Amount	1	0.158	0.1582	5.032	0.025
Residuals	2182	68.614	0.0314		

Table 33. Prior Authorization by service type ANOVA results (Outpatient Consultations)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	41.184	5.1481	142.569	0.000
year	2	0.123	0.0617	1.709	0.181
gender_code	2	0.677	0.3383	9.369	0.000
marital_status_code	4	8.468	2.1171	58.630	0.000
employment_status_code	3	2.068	0.6894	19.091	0.000
Disab	1	5.348	5.3484	148.116	0.000
age	1	3.339	3.3385	92.456	0.000
Avg_Visits	1	4.722	4.7220	130.769	0.000
Average_Charge_Amount	1	2.882	2.8819	79.810	0.000
Average_Paid_Amount	1	0.011	0.0112	0.310	0.578
Residuals	1923	69.438	0.0361		

Table 34. Prior Authorization by service type ANOVA results (Telehealth)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	57.674	7.2093	204.715	0.000
year	2	0.095	0.0473	1.343	0.261
gender_code	2	1.229	0.6145	17.451	0.000
marital_status_code	4	11.332	2.8330	80.446	0.000
employment_status_code	3	2.494	0.8315	23.611	0.000
Disab	1	2.702	2.7016	76.714	0.000
age	1	3.066	3.0661	87.065	0.000
Avg_Visits	1	4.986	4.9861	141.585	0.000
Average_Charge_Amount	1	4.442	4.4417	126.128	0.000
Average_Paid_Amount	1	1.306	1.3062	37.092	0.000
Residuals	1721	60.607	0.0352		

Table 35. Prior Authorization by service type ANOVA results (Psychiatric Care)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	22.670	2.8337	121.143	0.000
year	2	0.020	0.0100	0.427	0.652
gender_code	2	0.090	0.0448	1.913	0.148
marital_status_code	6	7.374	1.2291	52.543	0.000
employment_status_code	3	1.966	0.6554	28.016	0.000
Disab	1	2.394	2.3938	102.336	0.000
age	1	1.994	1.9944	85.262	0.000
Avg_Visits	1	2.333	2.3334	99.752	0.000
Average_Charge_Amount	1	3.482	3.4825	148.877	0.000
Average_Paid_Amount	1	0.012	0.0119	0.509	0.476
Residuals	2359	55.181	0.0234		

Table 36. Prior Authorization by service type ANOVA results (Physical Therapy)

Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	25.610	3.2012	110.152	0.000
year	2	0.184	0.0922	3.173	0.042
gender_code	2	0.132	0.0658	2.263	0.104
marital_status_code	6	6.511	1.0852	37.343	0.000
employment_status_code	3	1.435	0.4782	16.454	0.000
Disab	1	3.770	3.7698	129.720	0.000
age	1	3.770	3.7696	129.711	0.000
Avg_Visits	1	2.968	2.9676	102.114	0.000
Average_Charge_Amount	1	4.404	4.4039	151.536	0.000
Average_Paid_Amount	1	0.241	0.2406	8.278	0.004
Residuals	2086	60.622	0.0291		

Table 37. Prior Authorization by service type ANOVA results (Durable Medical Equipment)

Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	34.711	4.3389	147.052	0.000
year	2	0.193	0.0963	3.263	0.038
gender_code	1	0.039	0.0392	1.327	0.249
marital_status_code	6	17.250	2.8750	97.439	0.000
employment_status_code	3	1.670	0.5568	18.870	0.000
Disab	1	7.024	7.0240	238.055	0.000
age	1	2.333	2.3329	79.065	0.000
Avg_Visits	1	0.028	0.0285	0.965	0.326
Average_Charge_Amount	1	4.040	4.0403	136.935	0.000
Average_Paid_Amount	1	0.864	0.8639	29.281	0.000
Residuals	1864	54.999	0.0295		

Table 38. Prior Authorization by service type ANOVA results (Oncology)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	30.503	3.8129	156.845	0.000
year	2	0.110	0.0552	2.272	0.103
gender_code	1	0.108	0.1075	4.422	0.036
marital_status_code	6	8.735	1.4558	59.883	0.000
employment_status_code	3	1.868	0.6226	25.609	0.000
Disab	1	2.340	2.3405	96.277	0.000
age	1	1.561	1.5612	64.221	0.000
Avg_Visits	1	3.240	3.2404	133.296	0.000
Average_Charge_Amount	1	1.153	1.1530	47.430	0.000
Average_Paid_Amount	1	0.000	0.0000	0.001	0.971
Residuals	2089	50.784	0.0243		

Table 39. Prior Authorization by service type ANOVA results (Prescription Medicines)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	44.081	5.5102	167.330	0.000
year	2	0.342	0.1710	5.194	0.006
gender_code	1	0.003	0.0031	0.095	0.758
marital_status_code	6	11.890	1.9816	60.177	0.000
employment_status_code	3	2.854	0.9514	28.891	0.000
Disab	1	1.489	1.4892	45.223	0.000
age	1	1.404	1.4043	42.646	0.000
Avg_Visits	1	2.829	2.8291	85.913	0.000
Average_Charge_Amount	1	0.939	0.9390	28.514	0.000
Average_Paid_Amount	1	0.056	0.0556	1.688	0.194
Residuals	1277	42.052	0.0329		

Table 40. Prior Authorization by service type ANOVA results (Home Health)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	56.433	7.0541	180.446	0.000
year	2	0.369	0.1845	4.719	0.009
gender_code	2	0.154	0.0770	1.969	0.140
marital_status_code	4	8.003	2.0007	51.179	0.000
employment_status_code	3	4.572	1.5238	38.980	0.000
Disab	1	6.187	6.1872	158.271	0.000
age	1	2.950	2.9495	75.449	0.000
Avg_Visits	1	1.560	1.5603	39.913	0.000
Average_Charge_Amount	1	0.238	0.2383	6.095	0.014
Average_Paid_Amount	1	0.324	0.3238	8.284	0.004
Residuals	1687	65.949	0.0391		

Table 41. Prior Authorization by service type ANOVA results (Chiropractic Care)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	34.209	4.2761	152.313	0.000
year	2	0.434	0.2170	7.728	0.000
gender_code	1	0.065	0.0655	2.332	0.127
marital_status_code	4	8.481	2.1202	75.520	0.000
employment_status_code	3	0.217	0.0723	2.576	0.052
Disab	1	2.147	2.1474	76.489	0.000
age	1	3.147	3.1469	112.090	0.000
Avg_Visits	1	4.921	4.9213	175.294	0.000
Average_Charge_Amount	1	1.662	1.6620	59.199	0.000
Average_Paid_Amount	1	1.713	1.7132	61.023	0.000
Residuals	1448	40.652	0.0281		

Table 42. Prior Authorization by service type ANOVA results (Hospice)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	91.816	11.4770	334.568	0.000
year	2	1.273	0.6367	18.561	0.000
gender_code	1	0.741	0.7409	21.598	0.000
marital_status_code	4	0.576	0.1441	4.201	0.002
employment_status_code	3	1.691	0.5638	16.434	0.000
Disab	1	3.446	3.4455	100.441	0.000
age	1	0.027	0.0268	0.781	0.377
Avg_Visits	1	0.000	0.0003	0.008	0.928
Average_Charge_Amount	1	0.121	0.1212	3.533	0.060
Average_Paid_Amount	1	0.016	0.0163	0.474	0.491
Residuals	1011	34.681	0.0343		

Table 43. Referral required by service type ANOVA results (Dialysis)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	174.668	21.8335	668.473	0.00
year	2	0.856	0.4280	13.103	0.00
gender_code	1	0.044	0.0438	1.341	0.25
marital_status_code	6	3.968	0.6613	20.247	0.00
employment_status_code	2	3.116	1.5579	47.699	0.00
Disab	1	0.356	0.3564	10.911	0.00
age	1	1.263	1.2634	38.681	0.00
Avg_Visits	1	0.365	0.3646	11.162	0.00
Average_Charge_Amount	1	2.138	2.1376	65.447	0.00
Average_Paid_Amount	1	0.493	0.4929	15.092	0.00
Residuals	1285	41.970	0.0327		

Table 44. Referral required by service type ANOVA results (Emergency Department)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	240.974	30.1217	702.715	0.00
year	2	0.080	0.0399	0.931	0.39
gender_code	3	0.649	0.2164	5.049	0.00
marital_status_code	6	9.636	1.6060	37.468	0.00
employment_status_code	3	12.254	4.0846	95.289	0.00
Disab	1	2.356	2.3562	54.969	0.00
age	1	3.228	3.2283	75.313	0.00
Avg_Visits	1	8.478	8.4781	197.788	0.00
Average_Charge_Amount	1	2.130	2.1302	49.695	0.00
Average_Paid_Amount	1	0.246	0.2464	5.748	0.02
Residuals	3102	132.966	0.0429		

Table 45. Referral required by service type ANOVA results (Imaging)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	204.477	25.5596	554.430	0.00
year	2	0.080	0.0402	0.873	0.42
gender_code	3	1.280	0.4267	9.256	0.00
marital_status_code	6	11.406	1.9010	41.235	0.00
employment_status_code	3	15.370	5.1235	111.137	0.00
Disab	1	5.306	5.3064	115.104	0.00
age	1	4.597	4.5968	99.713	0.00
Avg_Visits	1	8.523	8.5231	184.881	0.00
Average_Charge_Amount	1	1.725	1.7247	37.412	0.00
Average_Paid_Amount	1	0.484	0.4842	10.503	0.00
Residuals	3225	148.675	0.0461		

Table 46. Referral required by service type ANOVA results (Inpatient Acute Care)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	270.160	33.7700	915.897	0.00
year	2	1.223	0.6117	16.590	0.00
gender_code	2	0.595	0.2977	8.073	0.00
marital_status_code	6	5.415	0.9024	24.476	0.00
employment_status_code	3	9.538	3.1795	86.232	0.00
Disab	1	2.209	2.2092	59.917	0.00
age	1	2.400	2.3995	65.078	0.00
Avg_Visits	1	4.950	4.9500	134.253	0.00
Average_Charge_Amount	1	0.124	0.1241	3.367	0.07
Average_Paid_Amount	1	0.321	0.3210	8.705	0.00
Residuals	2636	97.192	0.0369		

Table 47. Referral required by service type ANOVA results (Inpatient Non-Acute Care)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	249.366	31.1708	751.271	0.00
year	2	1.237	0.6184	14.904	0.00
gender_code	2	0.723	0.3613	8.707	0.00
marital_status_code	6	5.985	0.9974	24.040	0.00
employment_status_code	3	6.638	2.2127	53.331	0.00
Disab	1	1.553	1.5525	37.419	0.00
age	1	1.595	1.5955	38.454	0.00
Avg_Visits	1	3.319	3.3195	80.005	0.00
Average_Charge_Amount	1	0.446	0.4457	10.743	0.00
Average_Paid_Amount	1	0.346	0.3460	8.339	0.00
Residuals	2276	94.433	0.0415		

Table 48. Referral required by service type ANOVA results (Outpatient Consultations)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	210.917	26.3646	528.832	0.00
year	2	0.989	0.4943	9.915	0.00
gender_code	3	0.608	0.2028	4.069	0.01
marital_status_code	6	6.029	1.0048	20.154	0.00
employment_status_code	3	22.406	7.4686	149.808	0.00
Disab	1	1.882	1.8819	37.747	0.00
age	1	4.492	4.4924	90.110	0.00
Avg_Visits	1	4.243	4.2429	85.105	0.00
Average_Charge_Amount	1	0.245	0.2452	4.918	0.03
Average_Paid_Amount	1	0.105	0.1049	2.103	0.15
Residuals	2391	119.202	0.0499		

Table 49. Referral required by service type ANOVA results (Telehealth)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	168.584	21.0730	446.473	0.00
year	2	0.040	0.0202	0.428	0.65
gender_code	2	0.263	0.1316	2.789	0.06
marital_status_code	6	6.136	1.0226	21.667	0.00
employment_status_code	3	24.602	8.2006	173.746	0.00
Disab	1	2.663	2.6626	56.413	0.00
age	1	2.407	2.4071	50.999	0.00
Avg_Visits	1	8.703	8.7029	184.389	0.00
Average_Charge_Amount	1	1.933	1.9331	40.957	0.00
Average_Paid_Amount	1	1.252	1.2518	26.522	0.00
Residuals	2368	111.767	0.0472		

Table 50. Referral required by service type ANOVA results (Psychiatric Care)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	249.861	31.2327	716.260	0.000
year	2	0.115	0.0574	1.317	0.268
gender_code	3	1.370	0.4565	10.469	0.000
marital_status_code	6	10.161	1.6935	38.836	0.000
employment_status_code	3	13.893	4.6309	106.201	0.000
Disab	1	2.222	2.2221	50.960	0.000
age	1	3.863	3.8635	88.601	0.000
Avg_Visits	1	7.996	7.9960	183.372	0.000
Average_Charge_Amount	1	1.927	1.9266	44.182	0.000
Average_Paid_Amount	1	0.850	0.8500	19.494	0.000
Residuals	3216	140.234	0.0436		

Table 51. Referral required by service type ANOVA results (Physical Therapy)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	200.185	25.0231	534.365	0.00
year	2	0.461	0.2307	4.926	0.01
gender_code	3	0.638	0.2125	4.538	0.00
marital_status_code	6	9.454	1.5757	33.649	0.00
employment_status_code	3	10.613	3.5375	75.543	0.00
Disab	1	4.354	4.3538	92.975	0.00
age	1	2.785	2.7845	59.463	0.00
Avg_Visits	1	4.935	4.9351	105.388	0.00
Average_Charge_Amount	1	1.613	1.6131	34.448	0.00
Average_Paid_Amount	1	1.242	1.2418	26.519	0.00
Residuals	3047	142.684	0.0468		

Table 52. Referral required by service type ANOVA results (Durable Medical Equipment)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	172.707	21.5884	424.100	0.00
year	2	0.470	0.2349	4.614	0.01
gender_code	2	0.191	0.0954	1.874	0.15
marital_status_code	6	9.529	1.5882	31.201	0.00
employment_status_code	3	14.242	4.7475	93.264	0.00
Disab	1	7.085	7.0848	139.180	0.00
age	1	3.188	3.1877	62.621	0.00
Avg_Visits	1	3.179	3.1792	62.454	0.00
Average_Charge_Amount	1	0.707	0.7065	13.880	0.00
Average_Paid_Amount	1	0.051	0.0509	1.000	0.32
Residuals	2784	141.717	0.0509		

Table 53. Referral required by service type ANOVA results (Oncology)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	200.511	25.0638	536.424	0.00
year	2	0.290	0.1450	3.103	0.05
gender_code	3	0.389	0.1296	2.774	0.04
marital_status_code	6	9.076	1.5126	32.374	0.00
employment_status_code	3	15.886	5.2953	113.331	0.00
Disab	1	4.162	4.1616	89.067	0.00
age	1	4.326	4.3262	92.590	0.00
Avg_Visits	1	10.270	10.2697	219.795	0.00
Average_Charge_Amount	1	3.597	3.5971	76.987	0.00
Average_Paid_Amount	1	1.285	1.2854	27.510	0.00
Residuals	3012	140.732	0.0467		

Table 54. Referral required by service type ANOVA results (Prescription Medicines)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	116.055	14.5068	317.751	0.00
year	2	3.061	1.5305	33.523	0.00
gender_code	1	0.086	0.0861	1.887	0.17
marital_status_code	6	8.022	1.3370	29.284	0.00
employment_status_code	3	16.333	5.4444	119.252	0.00
Disab	1	2.798	2.7984	61.295	0.00
age	1	2.620	2.6195	57.377	0.00
Avg_Visits	1	2.488	2.4879	54.494	0.00
Average_Charge_Amount	1	0.004	0.0043	0.095	0.76
Average_Paid_Amount	1	0.309	0.3090	6.767	0.01
Residuals	2318	105.828	0.0457		

Table 55. Referral required by service type ANOVA results (Home Health)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	167.937	20.9921	569.661	0.00
year	2	1.015	0.5074	13.769	0.00
gender_code	1	0.262	0.2619	7.108	0.01
marital_status_code	4	1.548	0.3871	10.505	0.00
employment_status_code	3	19.959	6.6528	180.537	0.00
Disab	1	1.077	1.0772	29.233	0.00
age	1	1.193	1.1933	32.383	0.00
Avg_Visits	1	4.630	4.6300	125.645	0.00
Average_Charge_Amount	1	0.070	0.0696	1.890	0.17
Average_Paid_Amount	1	0.278	0.2777	7.537	0.01
Residuals	1732	63.825	0.0369		

Table 56. Referral required by service type ANOVA results (Chiropractic Care)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	137.987	17.2484	363.735	0.00
year	2	0.271	0.1353	2.853	0.06
gender_code	3	1.235	0.4118	8.684	0.00
marital_status_code	6	8.308	1.3847	29.201	0.00
employment_status_code	3	9.789	3.2630	68.811	0.00
Disab	1	0.759	0.7592	16.010	0.00
age	1	5.153	5.1532	108.671	0.00
Avg_Visits	1	4.600	4.5999	97.004	0.00
Average_Charge_Amount	1	0.772	0.7718	16.275	0.00
Average_Paid_Amount	1	0.008	0.0083	0.175	0.68
Residuals	2052	97.306	0.0474		

Table 57. Referral required by service type ANOVA results (Hospice)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	122.931	15.3664	512.907	0.00
year	2	0.487	0.2437	8.136	0.00
gender_code	1	0.667	0.6670	22.262	0.00
marital_status_code	4	0.403	0.1007	3.361	0.01
employment_status_code	3	5.200	1.7334	57.858	0.00
Disab	1	1.377	1.3769	45.959	0.00
age	1	0.089	0.0893	2.981	0.08
Avg_Visits	1	1.090	1.0900	36.384	0.00
Average_Charge_Amount	1	0.012	0.0120	0.400	0.53
Average_Paid_Amount	1	0.464	0.4645	15.503	0.00
Residuals	1076	32.236	0.0300		

Table 58. Denied Claims by service type ANOVA results (Dialysis)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	47.4175	5.9272	180.625	0.000
year	2	0.3500	0.1750	5.333	0.005
gender_code	1	0.3477	0.3477	10.595	0.001
marital_status_code	4	10.2862	2.5716	78.365	0.000
employment_status_code	3	5.6950	1.8983	57.850	0.000
Disab	1	0.9489	0.9489	28.917	0.000
age	1	0.8729	0.8729	26.599	0.000
Avg_Visits	1	1.9209	1.9209	58.537	0.000
Average_Charge_Amount	1	0.7509	0.7509	22.883	0.000
Average_Paid_Amount	1	1.6333	1.6333	49.774	0.000
Residuals	1978	64.9080	0.0328		

Table 59. Denied Claims by service type ANOVA results (Emergency Department)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	34.7607	4.3451	120.012	0.000
year	2	0.1086	0.0543	1.499	0.223
gender_code	2	1.3521	0.6761	18.673	0.000
marital_status_code	6	25.9572	4.3262	119.490	0.000
employment_status_code	3	6.3611	2.1204	58.564	0.000
Disab	1	2.1778	2.1778	60.151	0.000
age	1	2.7548	2.7548	76.088	0.000
Avg_Visits	1	13.7984	13.7984	381.112	0.000
Average_Charge_Amount	1	2.7597	2.7597	76.222	0.000
Average_Paid_Amount	1	1.3540	1.3540	37.396	0.000
Residuals	4053	146.7412	0.0362		

Table 60. Denied Claims by service type ANOVA results (Imaging)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	32.6588	4.0824	109.785	0.000
year	2	0.1810	0.0905	2.434	0.088
gender_code	2	0.5661	0.2830	7.612	0.001
marital_status_code	5	27.7243	5.5449	149.115	0.000
employment_status_code	3	3.3845	1.1282	30.339	0.000
Disab	1	2.9620	2.9620	79.655	0.000
age	1	3.2291	3.2291	86.838	0.000
Avg_Visits	1	17.3365	17.3365	466.221	0.000
Average_Charge_Amount	1	2.0006	2.0006	53.800	0.000
Average_Paid_Amount	1	0.8464	0.8464	22.761	0.000
Residuals	4049	150.5624	0.0372		

Table 61. Denied Claims by service type ANOVA results (Inpatient Acute Care)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	39.3152	4.9144	132.598	0.000
year	2	0.6248	0.3124	8.429	0.000
gender_code	2	0.8257	0.4129	11.139	0.000
marital_status_code	5	13.0542	2.6108	70.444	0.000
employment_status_code	3	9.8972	3.2991	89.014	0.000
Disab	1	1.6976	1.6976	45.803	0.000
age	1	2.7238	2.7238	73.491	0.000
Avg_Visits	1	16.8354	16.8354	454.244	0.000
Average_Charge_Amount	1	0.7895	0.7895	21.303	0.000
Average_Paid_Amount	1	0.5396	0.5396	14.559	0.000
Residuals	3785	140.2812	0.0371		

Table 62. Denied Claims by service type ANOVA results (Inpatient Non-Acute Care)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	48.4292	6.0537	160.958	0.000
year	2	0.3293	0.1647	4.378	0.013
gender_code	2	0.5689	0.2845	7.564	0.001
marital_status_code	5	11.5353	2.3071	61.342	0.000
employment_status_code	3	4.8240	1.6080	42.755	0.000
Disab	1	1.9857	1.9857	52.796	0.000
age	1	1.6172	1.6172	42.999	0.000
Avg_Visits	1	15.6322	15.6322	415.639	0.000
Average_Charge_Amount	1	1.4777	1.4777	39.289	0.000
Average_Paid_Amount	1	1.4227	1.4227	37.829	0.000
Residuals	3398	127.7989	0.0376		

Table 63. Denied Claims by service type ANOVA results (Outpatient Consultations)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	47.6044	5.9505	138.108	0.000
year	2	0.4774	0.2387	5.540	0.004
gender_code	2	0.0792	0.0396	0.919	0.399
marital_status_code	6	21.5699	3.5950	83.437	0.000
employment_status_code	3	4.1756	1.3919	32.304	0.000
Disab	1	1.8598	1.8598	43.164	0.000
age	1	4.3982	4.3982	102.079	0.000
Avg_Visits	1	17.2609	17.2609	400.613	0.000
Average_Charge_Amount	1	3.1218	3.1218	72.455	0.000
Average_Paid_Amount	1	0.2105	0.2105	4.884	0.027
Residuals	3322	143.1319	0.0431		

Table 64. Denied Claims by service type ANOVA results (Telehealth)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	43.4290	5.4286	128.602	0.000
year	2	0.6277	0.3138	7.435	0.001
gender_code	2	0.2674	0.1337	3.167	0.042
marital_status_code	6	24.0637	4.0106	95.010	0.000
employment_status_code	3	4.8834	1.6278	38.562	0.000
Disab	1	3.0436	3.0436	72.101	0.000
age	1	2.3613	2.3613	55.939	0.000
Avg_Visits	1	13.1276	13.1276	310.989	0.000
Average_Charge_Amount	1	0.6295	0.6295	14.913	0.000
Average_Paid_Amount	1	0.1915	0.1915	4.536	0.033
Residuals	2651	111.9054	0.0422		

Table 65. Denied Claims by service type ANOVA results (Psychiatric Care)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	28.6904	3.5863	103.551	0.000
year	2	0.0688	0.0344	0.993	0.371
gender_code	2	0.7950	0.3975	11.477	0.000
marital_status_code	6	26.9202	4.4867	129.549	0.000
employment_status_code	3	6.2490	2.0830	60.144	0.000
Disab	1	2.7808	2.7808	80.294	0.000
age	1	2.3298	2.3298	67.270	0.000
Avg_Visits	1	15.0940	15.0940	435.825	0.000
Average_Charge_Amount	1	3.2229	3.2229	93.058	0.000
Average_Paid_Amount	1	0.0439	0.0439	1.267	0.260
Residuals	4166	144.2817	0.0346		

Table 66. Denied Claims by service type ANOVA results (Physical Therapy)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	38.0555	4.7569	127.892	0.000
year	2	0.2305	0.1153	3.099	0.045
gender_code	2	0.4795	0.2397	6.445	0.002
marital_status_code	5	35.8184	7.1637	192.598	0.000
employment_status_code	3	2.4967	0.8322	22.375	0.000
Disab	1	4.2953	4.2953	115.481	0.000
age	1	3.5007	3.5007	94.117	0.000
Avg_Visits	1	11.7149	11.7149	314.958	0.000
Average_Charge_Amount	1	2.8946	2.8946	77.824	0.000
Average_Paid_Amount	1	6.9682	6.9682	187.343	0.000
Residuals	3927	146.0646	0.0372		

Table 67. Denied Claims by service type ANOVA results (Durable Medical Equipment)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	39.4330	4.9291	118.773	0.000
year	2	0.0039	0.0019	0.047	0.954
gender_code	2	1.4826	0.7413	17.863	0.000
marital_status_code	5	48.5015	9.7003	233.739	0.000
employment_status_code	3	5.0374	1.6791	40.460	0.000
Disab	1	5.2050	5.2050	125.421	0.000
age	1	1.2254	1.2254	29.528	0.000
Avg_Visits	1	8.0381	8.0381	193.687	0.000
Average_Charge_Amount	1	0.7921	0.7921	19.087	0.000
Average_Paid_Amount	1	5.2824	5.2824	127.286	0.000
Residuals	3377	140.1472	0.0415		

Table 68. Denied Claims required by service type ANOVA results (Oncology)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	30.6406	3.8301	100.345	0.000
year	2	0.0145	0.0073	0.190	0.827
gender_code	2	0.8241	0.4121	10.796	0.000
marital_status_code	5	32.9620	6.5924	172.716	0.000
employment_status_code	3	3.6605	1.2202	31.968	0.000
Disab	1	3.3070	3.3070	86.640	0.000
age	1	1.7192	1.7192	45.043	0.000
Avg_Visits	1	17.0722	17.0722	447.280	0.000
Average_Charge_Amount	1	2.8550	2.8550	74.798	0.000
Average_Paid_Amount	1	1.4398	1.4398	37.722	0.000
Residuals	3801	145.0805	0.0382		

Table 69. Denied Claims by service type ANOVA results (Prescription Medicines)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	30.8809	3.8601	99.398	0.000
year	2	0.1259	0.0630	1.621	0.198
gender_code	2	0.5430	0.2715	6.991	0.001
marital_status_code	5	46.5718	9.3144	239.844	0.000
employment_status_code	3	17.0406	5.6802	146.265	0.000
Disab	1	4.5232	4.5232	116.472	0.000
age	1	0.9938	0.9938	25.591	0.000
Avg_Visits	1	13.6493	13.6493	351.470	0.000
Average_Charge_Amount	1	0.4164	0.4164	10.721	0.001
Average_Paid_Amount	1	9.1984	9.1984	236.858	0.000
Residuals	2514	97.6312	0.0388		

Table 70. Denied Claims by service type ANOVA results (Home Health)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	40.5315	5.0664	154.549	0.000
year	2	0.3589	0.1794	5.473	0.004
gender_code	2	0.4237	0.2118	6.462	0.002
marital_status_code	5	15.2869	3.0574	93.264	0.000
employment_status_code	3	4.4036	1.4679	44.776	0.000
Disab	1	2.0744	2.0744	63.279	0.000
age	1	0.4569	0.4569	13.936	0.000
Avg_Visits	1	6.3379	6.3379	193.333	0.000
Average_Charge_Amount	1	0.1407	0.1407	4.293	0.038
Average_Paid_Amount	1	1.2872	1.2872	39.267	0.000
Residuals	2423	79.4313	0.0328		

Table 71. Denied Claims by service type ANOVA results (Chiropractic Care)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	44.2596	5.5325	161.375	0.000
year	2	1.3453	0.6726	19.620	0.000
gender_code	1	0.1852	0.1852	5.402	0.020
marital_status_code	6	46.0335	7.6722	223.790	0.000
employment_status_code	3	1.4381	0.4794	13.982	0.000
Disab	1	4.1577	4.1577	121.274	0.000
age	1	3.3561	3.3561	97.893	0.000
Avg_Visits	1	14.0261	14.0261	409.125	0.000
Average_Charge_Amount	1	1.2564	1.2564	36.647	0.000
Average_Paid_Amount	1	4.4425	4.4425	129.581	0.000
Residuals	2822	96.7473	0.0343		

Table 72. Denied Claims by service type ANOVA results (Hospice)					
Variable	Degrees of Freedom	Sum of Squares	Mean Square	F value	p-value
payer_name.x	8	36.2416	4.5302	154.269	0.000
year	2	0.3893	0.1946	6.628	0.001
gender_code	1	0.1399	0.1399	4.764	0.029
marital_status_code	5	12.5593	2.5119	85.537	0.000
employment_status_code	3	3.9059	1.3020	44.336	0.000
Disab	1	0.3633	0.3633	12.370	0.000
age	1	0.0517	0.0517	1.759	0.185
Avg_Visits	1	7.1166	7.1166	242.346	0.000
Average_Charge_Amount	1	0.2450	0.2450	8.343	0.004
Average_Paid_Amount	1	0.9429	0.9429	32.107	0.000
Residuals	1608	47.2200	0.0294		