

MILLIMAN RESEARCH REPORT

The cost burden of blood cancer care in Medicare

A longitudinal analysis of Medicare Advantage and Fee for Service patients diagnosed with blood cancer

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Executive Summary

Survival of older patients with blood cancers has improved since 2000 as more efficacious, less toxic therapies have been introduced.ⁱ However, as more effective treatments for blood cancer patients have become available, health care costs for newly diagnosed blood cancer patients have risen. These costs vary depending on factors such as blood cancer type, demographics, selected treatments as well as insurance coverage and benefit design. This analysis focuses on understanding the impact of these factors and the drivers of health care costs for newly diagnosed Medicare blood cancer patients.

In a prior study, Milliman reported on the health care costs incurred by commercially insured patients with newly diagnosed blood cancer.ⁱⁱ To complement the findings of the prior study, in this study, we analyze the health care costs incurred by Medicare beneficiaries with newly diagnosed blood cancer including acute leukemia, chronic leukemia, lymphoma, multiple myeloma, and bone marrow disorders. Similar to our prior study, we summarize total health care expenditures from month of diagnosis through up to three years following diagnosis. We report total allowed spending (amounts paid by both Medicare and the patient combined) and patient total out-of-pocket costs (sum of deductibles, copays, and coinsurance amounts) incurred for all medical and prescription drug services reported.

We analyzed the CMS 100% Medicare Research Identifiable Part A, B and D Fee for Service (FFS) beneficiary database (~35 million enrollees annually) and our proprietary Medicare Advantage database for members with Part D coverage (MAPD) (~ 2 million enrollees annually). We identified 35,877 FFS and 1,898 MAPD patients with newly diagnosed blood cancer in 2015. We identified several key findings for these Medicare populations including:

Blood cancer care is very expensive to the healthcare system (Sections: II.a, II.c., II.e)

For actively treated blood cancer patients, average allowed spending incurred during the two years following diagnosis was \$200,409 per FFS patient and \$165,967 per MAPD patient.

- Costs were highest in the first year following diagnosis, particularly in the month of diagnosis. The average allowed costs for patients in year one was almost two times higher than costs incurred in year two: \$131,406 vs \$69,004 (FFS) and \$114,751 vs \$51,216 (MAPD).
- The magnitude of spending varied widely by cancer type. Average allowed spending incurred during the two years following diagnosis ranged from \$309,408 (FFS) and \$255,652 (MAPD) per patient for acute leukemia to \$189,143 (FFS) and \$147,372 (MAPD) for chronic leukemia.

Blood cancer allowed spending is driven by anticancer drug therapy (Section II.e)

Among actively treated blood cancer patients, 93% of MAPD patients and 92% of FFS patients receive anticancer drug therapy within the first 90 days after diagnosis.

- Anticancer drug therapy contributes 53% (\$72,692) of FFS and 55% (\$64,968) of MAPD average allowed spending in the first year after diagnosis.
- Some patients incurred very high anticancer drug therapy allowed spending. At the 90th cost percentile among acute leukemia patients who utilize, we identified average allowed spending per patient of \$142,570 Part B and \$12,928 Part D (FFS) and \$122,307 Part B and \$20,373 Part D (MAPD) on anticancer drug therapy in the first year after diagnosis.
- Spending on Part B anticancer drug therapy is significantly higher than spending on Part D anticancer drug therapy in the first year after diagnosis: \$53,524 vs \$19,167 (FFS) and \$49,375 vs \$15,593 (MAPD) average allowed spending.
- For patients receiving certain combination therapies—anticancer drug therapy in both Part B and Part D—in the first year after diagnosis (3.4% for FFS patients and 4.3% for MAPD patients), anticancer drug therapy spending was very high: \$106,371 for FFS patients and \$104,021 for MAPD patients.

Patient out-of-pocket (OOP) costs are very high (Sections: II.b, II.d, II.f)

For actively treated blood cancer patients, average OOP costs for year one and two were \$17,084 and \$8,295 respectively per FFS patient and \$6,896 and \$2,603 respectively per MAPD patient.

- Some patients incurred very high OOP anticancer drug therapy costs. For example, at the 90th cost percentile for chronic leukemia patients, we identified \$14,899 Part B and \$10,076 Part D (FFS) and \$8,942 Part B and \$2,652 Part D (MAPD) average OOP costs per patient for anticancer drug therapy in the first year after diagnosis.
- For those who used anticancer drug therapy, over half of the average OOP costs in the first year following diagnosis was for anticancer drug therapy and was significantly higher for FFS vs MAPD: \$10,796 (FFS) and \$4,240 (MAPD) average OOP costs per patient for anticancer drug therapy.

The dynamic of higher cost sharing for FFS beneficiaries is influenced by several benefit design elements for Medicare Advantage (MA), FFS and Part D plans. Under an MA plan, members have an OOP cost sharing maximum for certain medical services (\$6,700 in 2015, the year of diagnosis in this study) while no such OOP maximum exists under the FFS Part A or B benefit. For FFS members with high cost Part B treatments, the cost sharing burden can be substantial as the beneficiary is responsible for a typical 20% copayment without protection from a maximum out of pocket cap. The Part D prescription drug benefit under a MAPD plan and under a PDP plan also introduces cost sharing burden for members with high cost prescription drug treatments since many of these members reach and enter the catastrophic zone which has no cap on out of pocket payments. These benefit design dynamics produce a significant OOP cost sharing burden for MAPD members and more so for FFS beneficiaries with newly diagnosed blood cancer.

Less than half of newly diagnosed blood cancer patients receive active treatment for their blood cancer (Section II.c)

For newly diagnosed blood cancer patients, 45% of the MAPD population and 41% of the FFS population received active treatment for their blood cancer within 90 days of diagnosis. Active treatment included anticancer drug agents, radiation oncology therapy, or stem cell/bone marrow transplants.

Treatment rates varied widely by cancer type, with the lowest rates of active treatment among bone marrow disorder patients, 15% (FFS) and 19% (MAPD), and much higher rates of active treatment among multiple myeloma patients 58% (FFS) and 59% (MAPD).

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It is not possible to capture all factors that may be significant. We present national average data for MAPD beneficiaries based on Milliman's own 2014-2016 consolidated database and for FFS beneficiaries based on the CMS 100% Medicare Research Identifiable Part A, B and D Fee for Service (FFS) beneficiary database for 2014-2017. Findings for particular populations and for different time periods will vary. In particular, the blood cancer treatment landscape is evolving, and the impact of recent novel therapies and patent expirations may affect current or future costs. We hope the outcomes presented in this study will inform payers, patients, advocacy groups and policymakers alike.

Background

According to recent data from the National Cancer Institute (NCI) Surveillance, Epidemiology, and End Results (SEER) Program registry, lymphoma, myeloma, and leukemia are projected to account for over 175,000 new cancer cases in 2019 - 10% of all expected new cancer cases and over 9% of cancer related deaths.ⁱⁱⁱ Medicare patients, particularly the aged, are subject to a higher incidence of blood cancer diagnosis. Seven in every 100,000 people under age 65 received a leukemia diagnosis, based on SEER's 2012-2016 registry data, as compared to 63 in every 100,000 people 65 or older. Similarly, less than 3 in 100,000 received a diagnosis of myeloma in the younger population versus 36 per 100,000 people for ages 65 and older.

Substantial healthcare costs are associated with treatment of patients with blood cancer and in particular for the Medicare population, and these costs continue to increase. One study found the average lifetime costs of a chronic lymphocytic leukemia (CLL) Medicare patient (average mean observation period 39.4 months) was reported to be \$87,151 compared to \$47,642 for matched controls (1999-2007).^{iv} Another study on CLL Medicare patients reported high and increasing costs of treating CLL as per-person lifetime cost of CLL treatment for patients initiating oral therapy in 2011, 2014 and 2016 was \$147,000, \$331,000 and \$604,000 respectively and patient OOP (OOP) cost sharing of \$9,200, \$27,000 and \$57,000 respectively.^v A study examining costs for newly diagnosed acute myeloid leukemia (AML) patients using SEER data and linked Medicare claims (1997-2007) reported all-cause healthcare costs of \$96,078 with a median survival of 7.0 months.^{vi} Another study of newly diagnosed AML Medicare patients, using the SEER and linked Medicare claims (2006-2013), identified mean costs (net of cost sharing) of \$85,734 for induction therapy and \$28,843 for subsequent inpatient consolidation cycles.^{vii} A study of chronic myeloid leukemia Medicare patients newly starting on oral anticancer agents, using SEER and linked Part D data (2007-2012), identified monthly oral anticancer drug spend between \$3632 and \$8492 and 40% of patients without drug subsidies incurring OOP payments higher than \$913 per 30 day supply.^{viii} A study of multiple myeloma patients identified in MarketScan commercial and Medicare supplemental claims data reported average costs (2015 dollars) of over \$22,000 per patient per month during the first line of treatment and over \$47,000 per patient per month in months of third lines of treatment.^{ix}

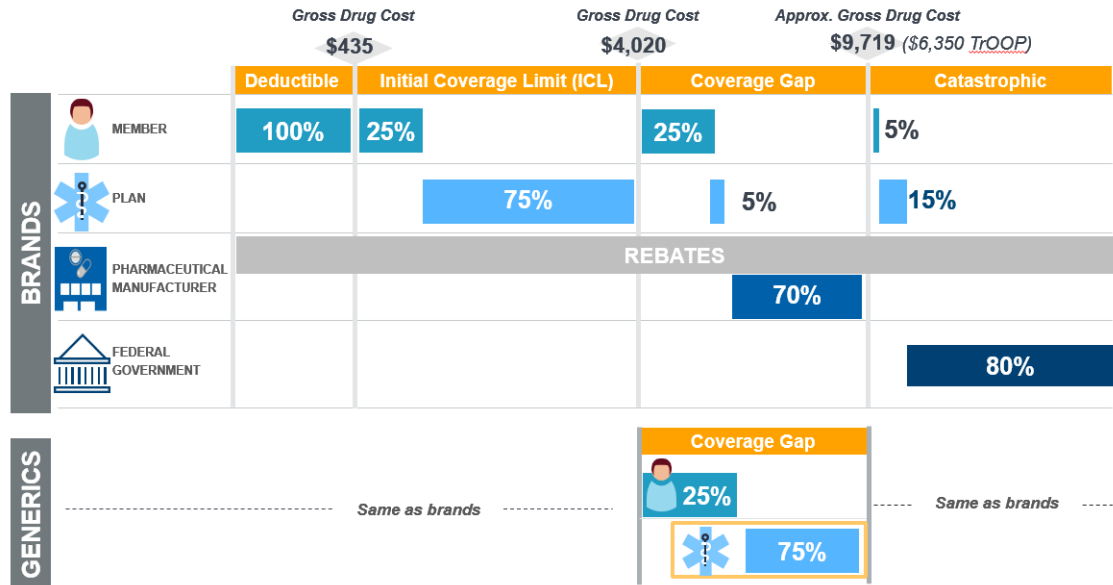
Along with the substantial healthcare costs associated with treatment of patients with blood cancer comes substantial OOP costs for patients. In particular, because of the Medicare Part A, B and D benefit design, the OOP burden can be greater for Medicare beneficiaries compared to commercially insured patients. For those enrolled in MA, beneficiaries are afforded some protection from high Part A and B OOP annual costs because of the federally mandated annual maximum out-of-pocket (MOOP) costs which in 2015 (the year of diagnosis used for this analysis) was \$6,700. For those enrolled in Fee for Service (FFS) plans, no MOOP exists for Part A and B cost sharing. Many FFS beneficiaries purchase supplemental insurance to offset this burden, while others have employer sponsored benefits or are dually eligible with Medicaid coverage for most OOP costs. According to a report by the Kaiser Family Foundation, 23% of Medicare FFS beneficiaries in 2015 were without supplemental coverage, where 59% had Medigap or employer-sponsored insurance, and 18% were dually eligible for Medicaid.^x Some beneficiaries qualify for Patient Assistance Programs (PAPs) or State Pharmaceutical Assistance Programs (SPAPs) and some products might be offset by manufacturer rebates. Such aid is not reflected in the out of pocket amounts reported in these analyses.

For Part D coverage, both MAPD and FFS are subject to the same coverage structure (at minimum) although some MAPD plans may offer lower annual deductibles. After meeting deductibles, all Medicare beneficiaries enrolled in Part D plans move along the same phases of coverage throughout the year as they incur more prescription costs (as measured by gross drug cost). Based on year specific thresholds, patients will face 25% cost sharing while they are in the initial coverage and coverage gap phases. After accruing approximately \$9,000 (based on the 2020 standard benefit design) in gross drug costs, patients move into the catastrophic phase where cost sharing is reduced to 5% until end of calendar year. Most treated blood cancer patients will reach catastrophic phase in the year of diagnosis. Figure 1 provides a demonstration of Part D phases of coverage.

FIGURE 1: EXAMPLE OF PART D DEFINED STANDARD BENEFIT

2020 Defined Standard Benefit

NLI Patient



Medicare affords some cost offsets for low income patients. Beneficiaries may qualify for Medicaid dual coverage which offsets medical cost sharing after Medicare pays their share. While the income levels to qualify for Medicaid vary by state, all patients who are eligible for dual coverage also qualify for the federal low income subsidy (LICS) for Part D cost sharing. In this analysis, we explore and compare allowed spending for both low income (LI) and non-low income (NLI) patients while patient OOP costs are only summarized for NLI.

The purpose of this study is to quantify the total allowed spending and cost sharing burden incurred by Medicare beneficiaries following a blood cancer diagnosis, and examine how these compare among MA members and traditional Medicare FFS beneficiaries. We first summarize annual costs and mortality for prevalent blood cancer patients in 2017. We then summarize treatment and costs for newly diagnosed blood cancer patients in 2014 and follow these patients until the end of 2016 for MAPD and 2017 for FFS patients. We additionally focus on anticancer drug therapies, split by those covered under the Part B benefit from those covered under the pharmacy Part D benefit. Throughout, we summarize blood cancers as a whole but also distinguish among five main types: acute leukemia, chronic leukemia, bone marrow disorders, lymphoma, and multiple myeloma. We present allowed spending (which includes amounts paid by both payer and patient combined) and cost sharing amounts which reflect the gross cost sharing amounts and not the amount net of any supplemental coverage.

Findings

I. INCIDENCE OF BLOOD CANCER

We identified 1,898 MAPD and 35,877 FFS incident blood cancer patients in 2015, with a total incidence rate of 199 and 192 per 100,000 beneficiaries, rates slightly lower than SEER's 65 and older rates.^{xi} Slightly lower incidence rates are commonly identified in claims data compared to survey/clinical data.

Figure 2 presents the sample size after identification of the 2015 incident blood cancer patient populations. Green cells indicate the count of the qualified primary analysis, or denominator, population. Orange cells indicate the count of newly identified blood cancer patients, or study population. Newly diagnosed blood cancer patients were identified among Medicare beneficiaries who reported continuous enrollment with both medical and pharmacy (Part D) benefits between January 2014 and January 2015. Patients enrolled in Medicare's FFS End State Renal Disease (ESRD) program at any point in the analysis period, 2014-2017, were excluded. Patients were required to be identified as having blood cancer in index year 2015 by reporting a blood cancer diagnosis code on one acute inpatient, observation, or emergency room claim or two or more outpatient professional evaluation and management claims. The date of service on the first identifying claim occurring in 2015 was designated each patient's index date (or date of diagnosis). We removed patients whose index claims reported diagnosis codes indicating remission or relapse or patients who reported indications of cancer or cancer treatments in the year leading up to diagnosis. For cancers other than acute leukemia, where the mortality rate is very high, we further required patients to report a second qualified claim with a blood cancer diagnosis code within 60 days following index.

FIGURE 2: SELECTION OF ANALYSIS COHORT – NEWLY DIAGNOSED BLOOD CANCER PATIENTS IN 2015

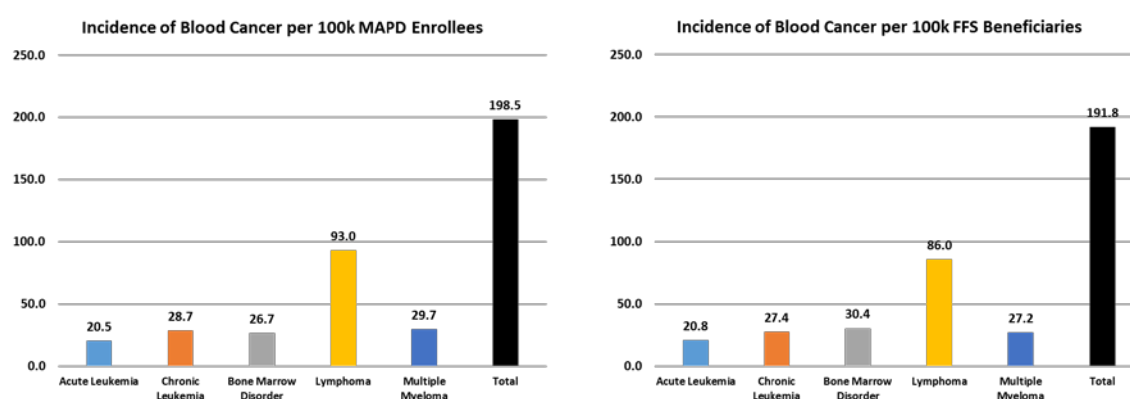
Population Derivation Step	MAPD	FFS
Data quality screens and enrollment in Part D in 2015	2,502,568	22,018,533
Denominator population: continuous qualified enrollment 1/2014 - 1/2015	956,359	19,059,684
Denominator population: not enrolled in Medicare's ESRD program during 2014-2017		18,703,736
Has a blood cancer diagnosis in 2015	14,766	317,666
First diagnosis in 2015 was not a code for relapse or remission	14,048	299,952
No prior cancer diagnosis or treatment one year prior to the index date	3,003	58,635
Has a second qualified blood cancer claim within 60 days of the index date*	1,898	35,877

* Not required for acute leukemia patients

Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries

Both MAPD and FFS cohorts had similar distributions of cancer type across the five blood cancer types with lymphoma having the highest incidence. Figure 3 provides incidence rates per 100,000 beneficiaries by cancer type.

FIGURE 3: NEWLY DIAGNOSED CANCER PATIENTS IN 2015



I.a. Characteristics of MAPD and FFS study populations

In Figure 4, we provide 2015 characteristics of the MAPD and FFS denominator population and blood cancer study population including Medicare eligibility status. We differentiate between dual (low income – Medicare and Medicaid coverage) and non-dual beneficiaries which can impact cost sharing as dual beneficiaries have no or very low cost sharing. We exclude Medicare dual eligible patients from summaries of patient OOP costs since Medicaid covers their cost sharing. While dual eligibility is not readily identified in the data set for MAPD beneficiaries, we are able to empirically identify those who qualify for Part D low income subsidies by examining the amounts of patient cost sharing paid. The rate of low income incident blood cancer patients are similar (26% FFS vs 24% for MAPD).

FIGURE 4: MAPD VS FFS 2015 POPULATION CHARACTERISTICS

	MAPD		FFS	
	Denominator Population	Study Population	Denominator Population	Study Population
Patient Count	956,359	1,898	18,703,736	35,877
Average Age	74.0	76.3	71.9	76.5
% Female	57.4%	44.9%	58.9%	52.0%
% Aged (vs. Disabled) ¹	88.2%	91.8%	71.8%	80.7%
% Low income ²	16.7%	23.6%	33.9%	25.5%

¹ For MAPD, aged patients are identified by ages 65 folder as of 2015. For FFS, aged patients were identified based on original reason for enrollment code.

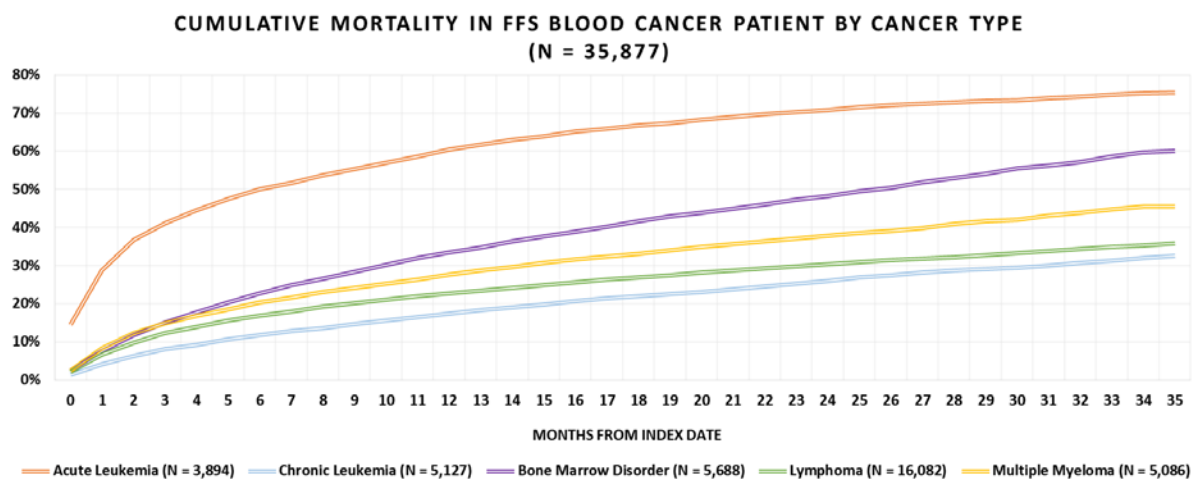
² For MAPD, low income was imputed based on specific cost share amounts paid on Part D drugs.

Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries

I.b. Mortality

Based on the FFS dataset, which provides mortality information, we analyzed mortality rates across cancer types and Medicare enrollment types. Figure 5 provides three-year mortality rates for each of the cancer types. Overall three-year mortality across all blood cancers was approximately 40%. Mortality is highest for acute leukemia (75% by month 35) followed by bone marrow disorder (60% by month 35). Mortality was lowest for chronic leukemia (35% by month 35).

FIGURE 5: CUMULATIVE 3-YEAR MORTALITY BY CANCER TYPE - FFS



Source: 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries

II. BLOOD CANCER SPENDING FOLLOWING A BLOOD CANCER DIAGNOSIS

In the following sections, we report the allowed spending (includes amounts paid for healthcare services by both payer and patient combined) and OOP spending for three cohorts of newly diagnosed blood cancer patients:

1. Total population of newly diagnosed blood cancer patients
2. Newly diagnosed blood cancer patients who had *anticancer treatment* (anticancer drug therapy, radiation oncology therapy, or stem cell/bone marrow transplants) within 90 days of index diagnosis
3. Patients in cohort 2 that had *anticancer drug agents* within 90 days of index diagnosis (93% of the *actively treated* blood cancer population for MAPD and 92% for FFS)

Figure 6 below provides the sample size counts of patients in each of these cohorts.

FIGURE 6: SUMMARY OF BLOOD CANCER COHORTS

Patient Cohort	MAPD		FFS	
	Patient Count	%	Patient Count	%
Total Blood Cancer Patients	1,898	100.0%	35,877	100.0%
Acute Leukemia	196	10.3%	3,894	10.9%
Chronic Leukemia	274	14.4%	5,127	14.3%
Bone Marrow Disorder	255	13.4%	5,688	15.9%
Lymphoma	889	46.8%	16,082	44.8%
Multiple Myeloma	284	15.0%	5,086	14.2%
Blood Cancer Patients Receiving Anticancer Therapy* within 90 days of Diagnosis	830	43.7%	13,872	38.7%
Acute Leukemia	84	4.4%	1,477	4.1%
Chronic Leukemia	65	3.4%	1,112	3.1%
Bone Marrow Disorder	48	2.5%	809	2.3%
Lymphoma	468	24.7%	7,688	21.4%
Multiple Myeloma	165	8.7%	2,786	7.8%
Blood Cancer Patients Receiving Anticancer Drug Agents** within 90 days of Diagnosis	772	40.7%	12,759	35.6%
Acute Leukemia	81	4.3%	1,394	3.9%
Chronic Leukemia	63	3.3%	1,082	3.0%
Bone Marrow Disorder	48	2.5%	762	2.1%
Lymphoma	425	22.4%	6,906	19.2%
Multiple Myeloma	155	8.2%	2,615	7.3%

Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries

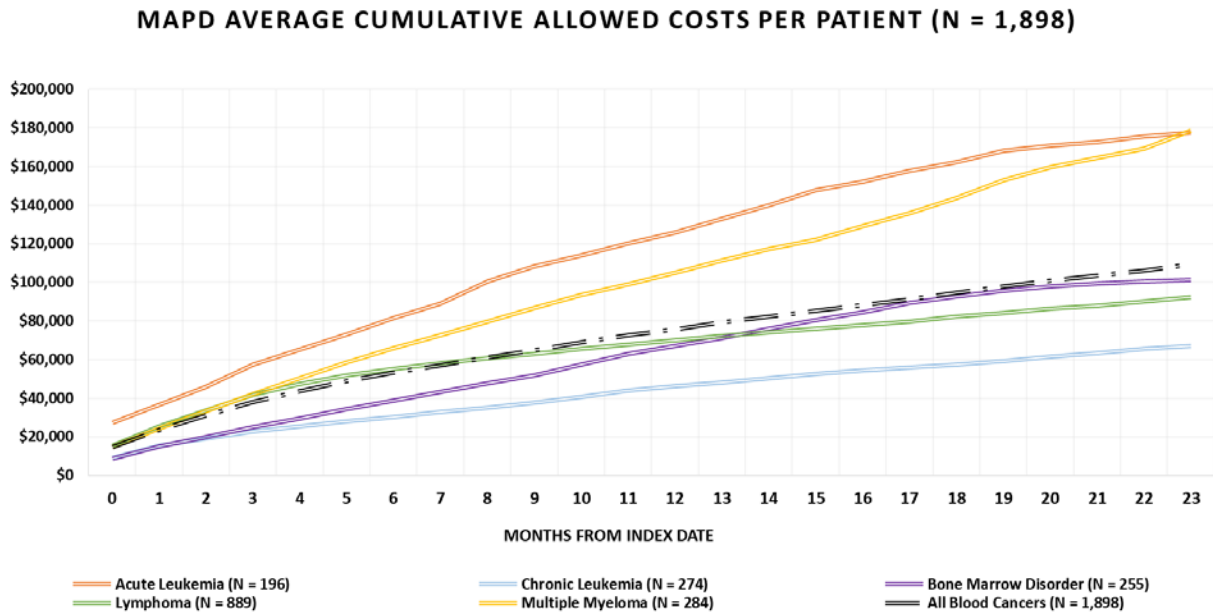
* Anticancer therapy includes anticancer drug agents, radiation oncology, and stem cell/bone marrow transplants.

** Anticancer drug agents include "Part B Anticancer Agents", "Part D Anticancer Agents", and "Chemotherapy DRG Inpatient Admits".

II.a. Total population of newly diagnosed blood cancer patients - Allowed Spending

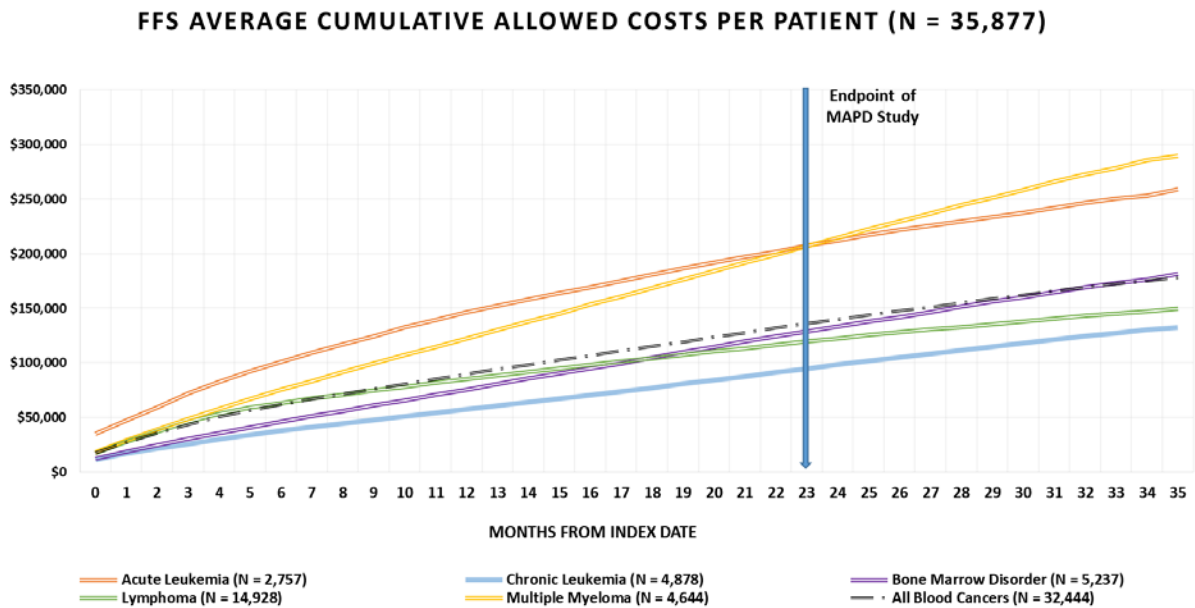
Our data sources allowed us to follow MAPD patients for up to 24 months following diagnosis and FFS patients for up to 36 months. After 24 months, FFS patients incurred almost \$136,000 in total healthcare expenditures on average and MAPD patients incurred slightly less at \$109,000. **(Figures 7A and 7B)** FFS patients incurred an average \$178,000 after three years. In both populations, acute leukemia patients incurred the highest costs through month 23 (\$176k for MAPD; \$207k for FFS) followed by multiple myeloma FFS patients who incurred the highest costs on average through month 35 (\$290k for multiple myeloma vs \$259k for acute leukemia).

FIGURE 7A: AVERAGE CUMULATIVE ALLOWED SPENDING PER INCIDENT BLOOD CANCER PATIENT - MAPD



Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees
 Allowed spending includes the amounts paid for healthcare services by both payer and patient combined.

FIGURE 7B: AVERAGE CUMULATIVE ALLOWED SPENDING PER INCIDENT BLOOD CANCER PATIENT - FFS



Source: 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries
 Allowed spending includes the amounts paid for healthcare services by both payer and patient combined.

Figure 8 compares average allowed spending of MAPD blood cancer patients to FFS. FFS patients incur consistently higher allowed spending than MAPD patients. The largest difference is found among chronic leukemia patients, who incur cumulative allowed spending that is 41% higher on average for FFS patients compared to MAPD patients in the two years following diagnosis.

FIGURE 8: COMPARISON OF MAPD AND FFS ALLOWED SPENDING PER PATIENT

Average Spending per Patient	MAPD	FFS	FFS/MAPD
All Blood Cancers			
Month of diagnosis	\$14,691	\$17,719	1.21
Cumulative Year 1	\$72,519	\$85,272	1.18
Cumulative Year 2	\$109,298	\$135,894	1.24
Cumulative Year 3	N/A	\$178,143	N/A
Acute Leukemia			
Month of diagnosis	\$27,253	\$35,202	1.29
Cumulative Year 1	\$120,320	\$139,416	1.16
Cumulative Year 2	\$177,543	\$207,385	1.17
Cumulative Year 3	N/A	\$258,694	N/A
Chronic Leukemia			
Month of diagnosis	\$9,166	\$11,568	1.26
Cumulative Year 1	\$43,919	\$54,091	1.23
Cumulative Year 2	\$67,072	\$94,857	1.41
Cumulative Year 3	N/A	\$132,369	N/A
Bone Marrow Disorder			
Month of diagnosis	\$8,848	\$12,286	1.39
Cumulative Year 1	\$62,993	\$70,804	1.12
Cumulative Year 2	\$101,310	\$128,618	1.27
Cumulative Year 3	N/A	\$181,637	N/A
Lymphoma			
Month of diagnosis	\$15,272	\$17,208	1.13
Cumulative Year 1	\$67,807	\$81,687	1.20
Cumulative Year 2	\$92,541	\$119,488	1.29
Cumulative Year 3	N/A	\$149,358	N/A
Multiple Myeloma			
Month of diagnosis	\$14,779	\$18,223	1.23
Cumulative Year 1	\$99,176	\$114,739	1.16
Cumulative Year 2	\$178,496	\$207,163	1.16
Cumulative Year 3	N/A	\$289,559	N/A

Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries

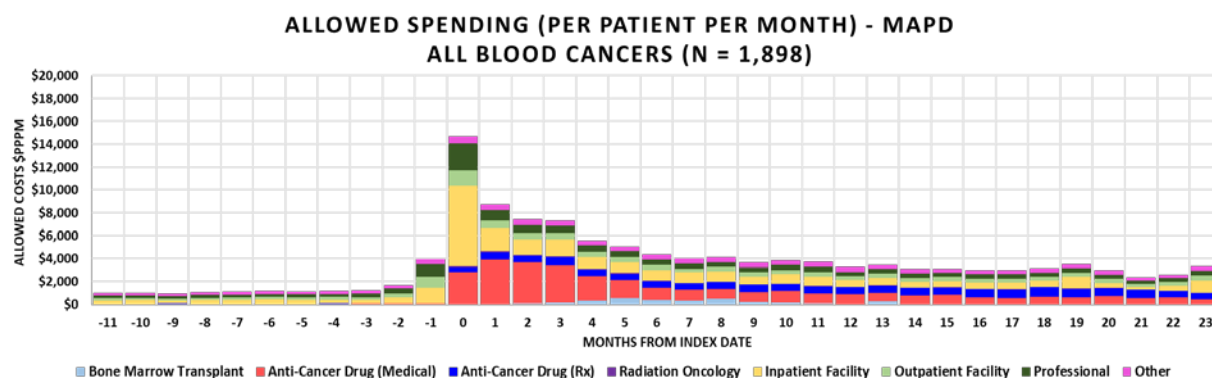
Allowed spending includes the amounts paid for healthcare services by both payer and patient combined.

We examined the month by month distribution of costs by key services from the diagnosis month through month 35 after the diagnosis month. We identified allowed spending associated with three main types of blood cancer treatments: anticancer drug therapy (distinguished between those covered by Part B, provider-administered prescription drugs and Part D, (self-administered prescription drugs), transplants including both bone marrow and stem cell, and radiation oncology. In addition to these treatments we provide costs by inpatient hospital, outpatient hospital, professional, and all other. Please refer to Appendix A for a complete description of the types of claims included in each category and the methodology section for details on how these claims were identified and assigned.

Month of diagnosis was the most costly for all blood cancer patients with an average allowed spend of \$14,700 for MAPD and \$17,719 for FFS patients. (**Figures 9A and 9B**) Inpatient hospital admissions, excluding those billed under chemotherapy MS-DRGs, was the largest contributor in the month of diagnosis; 48% for MAPD

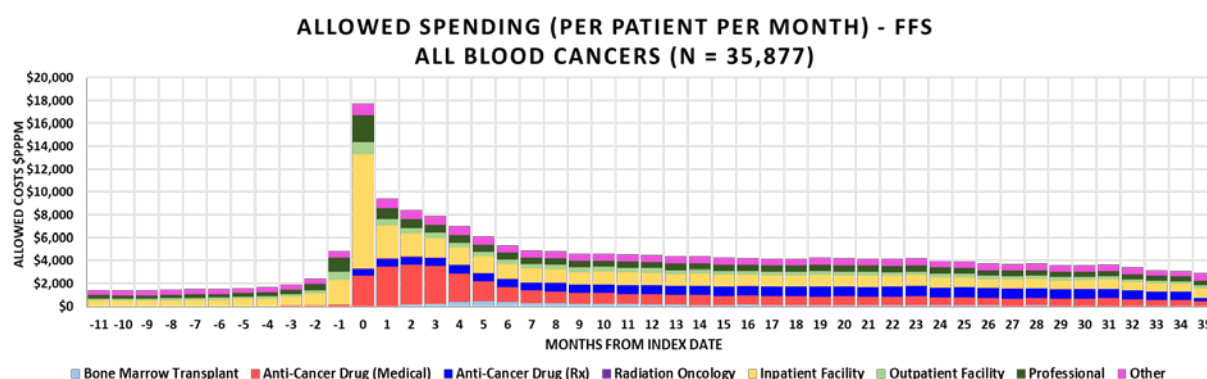
blood cancer patients and 60% for FFS blood cancer patients. In subsequent months, anticancer drug therapy contributed the most to average monthly costs, contributing 38-56% of total monthly costs in the first 12 months following diagnosis. While allowed spending levels decrease over time, they don't return to "before diagnosis" levels (months -11 to -2) during this study period.

FIGURE 9A: MAPD ALLOWED SPENDING PER BLOOD CANCER PATIENT PER MONTH, BY TYPE OF SERVICE (2015-2016)



Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees
Allowed spending includes the amounts paid for healthcare services by both payer and patient combined.

FIGURE 9B: FFS ALLOWED SPENDING PER BLOOD CANCER PATIENT PER MONTH, BY TYPE OF SERVICE (2015-2017)



Source: 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries
Allowed spending includes the amounts paid for healthcare services by both payer and patient combined.

While month of diagnosis is the most costly in terms of allowed spending, the composition and persistence of costs vary across cancer types. Appendix B provides the monthly allowed spending for each individual cancer for both MAPD and FFS. We highlight key findings from these figures below.

- Acute leukemia and multiple myeloma are the highest cost blood cancers.** In the month of diagnosis, acute leukemia patients incur an average allowed spend of \$35,000 (FFS) and multiple myeloma patients incur \$18,000 (FFS). Both cancers incur higher average monthly costs in the year following diagnosis ranging between \$6,000 and \$10,000. By comparison, the less expensive cancers, chronic leukemia and bone marrow disorder, incur an average month of diagnosis cost close to \$12,000 (FFS), with subsequent months in the first year ranging from \$4,000 to \$6,000.
- Anticancer drug therapy is used across all cancers but cost varies by cancer.** Anticancer drug therapies paid through Medicare's medical benefit (Part B) are higher than those covered by Part D therapies overall and for most blood cancers. However, chronic leukemia and multiple myeloma patients incurred more costs from Part D anticancer drug therapies which persisted throughout the study years.

- **Transplants are incurred predominantly by acute leukemia and multiple myeloma patients.**
Payments for these treatments peak around month 5 and contribute as much as 14% (FFS) and 23% (MAPD) of monthly allowed spend when present.

We compared these monthly findings across MAPD and FFS. Figure 10 provides the average allowed spending per patient per month for both the month of diagnosis and average monthly spend for the remainder of year 1 across cancer types. We report on inpatient facility, outpatient facility, and anticancer drug therapy which demonstrated the greatest variation of average monthly costs between FFS and MAPD. FFS patients incurred higher monthly average inpatient costs per patient, than MAPD, particularly in month of diagnosis. In contrast, MAPD patients incurred more costs in month of diagnosis for services billed by outpatient facilities. Anticancer drug therapy monthly allowed spending did not significantly vary between MAPD and FFS patients.

FIGURE 10: A COMPARISON OF MAPD TO FFS AVERAGE MONTHLY ALLOWED SPENDING BY SERVICE TYPE

Monthly Patient Allowed Spending	Inpatient Facility		Outpatient Facility		Anticancer Drug Therapy (Parts B and D)		All Other		Total		
	MAPD	FFS	MAPD	FFS	MAPD	FFS	MAPD	FFS	MAPD	FFS	FFS / MAPD
All Blood Cancers											
Month of Diagnosis	\$7,036	\$10,059	\$1,359	\$1,053	\$3,236	\$3,173	\$3,060	\$3,434	\$14,691	\$17,719	1.21
Year 1 Monthly Average*	\$1,122	\$1,542	\$477	\$426	\$2,571	\$2,674	\$1,285	\$1,653	\$5,455	\$6,294	1.15
Year 2 Monthly Average	\$595	\$1,006	\$358	\$339	\$1,376	\$1,662	\$814	\$1,216	\$3,142	\$4,223	1.34
Acute Leukemia											
Month of Diagnosis	\$17,483	\$23,327	\$1,149	\$727	\$4,800	\$6,587	\$3,820	\$4,561	\$27,253	\$35,202	1.29
Year 1 Monthly Average*	\$1,588	\$2,833	\$832	\$598	\$3,796	\$3,564	\$2,420	\$2,870	\$8,636	\$9,865	1.14
Year 2 Monthly Average	\$1,355	\$1,819	\$487	\$493	\$2,465	\$1,655	\$1,426	\$1,743	\$5,733	\$5,710	1.00
Chronic Leukemia											
Month of Diagnosis	\$4,971	\$6,861	\$917	\$689	\$1,135	\$1,504	\$2,142	\$2,515	\$9,166	\$11,568	1.26
Year 1 Monthly Average*	\$859	\$988	\$276	\$298	\$1,335	\$1,575	\$760	\$1,042	\$3,231	\$3,903	1.21
Year 2 Monthly Average	\$312	\$781	\$264	\$268	\$807	\$1,424	\$592	\$919	\$1,975	\$3,392	1.72
Bone Marrow Disorder											
Month of Diagnosis	\$4,194	\$7,300	\$817	\$641	\$1,655	\$1,520	\$2,183	\$2,825	\$8,848	\$12,286	1.39
Year 1 Monthly Average*	\$1,459	\$1,857	\$474	\$404	\$1,579	\$1,434	\$1,429	\$1,677	\$4,941	\$5,372	1.09
Year 2 Monthly Average	\$748	\$1,552	\$492	\$387	\$1,565	\$1,325	\$1,061	\$1,558	\$3,866	\$4,823	1.25
Lymphoma											
Month of Diagnosis	\$6,312	\$8,838	\$1,722	\$1,426	\$3,962	\$3,401	\$3,276	\$3,544	\$15,272	\$17,208	1.13
Year 1 Monthly Average*	\$977	\$1,358	\$443	\$433	\$2,591	\$2,764	\$1,057	\$1,497	\$5,068	\$6,052	1.19
Year 2 Monthly Average	\$482	\$809	\$279	\$314	\$614	\$943	\$682	\$1,091	\$2,057	\$3,156	1.53
Multiple Myeloma											
Month of Diagnosis	\$6,636	\$10,070	\$1,280	\$954	\$3,334	\$3,370	\$3,529	\$3,829	\$14,779	\$18,223	1.23
Year 1 Monthly Average*	\$1,307	\$1,738	\$612	\$477	\$4,035	\$4,477	\$1,838	\$2,173	\$7,792	\$8,864	1.14
Year 2 Monthly Average	\$853	\$1,092	\$568	\$402	\$3,902	\$4,753	\$1,049	\$1,452	\$6,372	\$7,699	1.21

* Summary of 11 months following but not including month of diagnosis

Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries

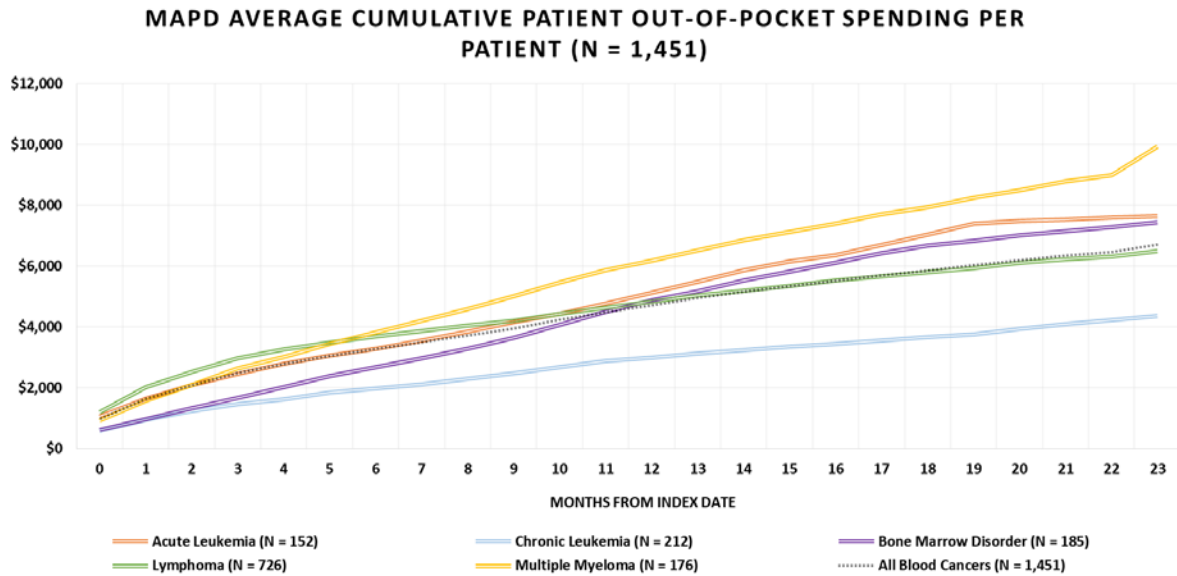
Allowed spending includes the amounts paid for healthcare services by both payer and patient combined.

II.b. Total population of newly diagnosed blood cancer patients - OOP Spending

With the substantial allowed costs incurred by patients newly diagnosed with blood cancer, patients who do not qualify for government subsidies can accumulate significant OOP spending. Figures 11A and 11B provide the cumulative patient OOP spending in the years of analysis for non-low income (NLI) patients. After 24 months,

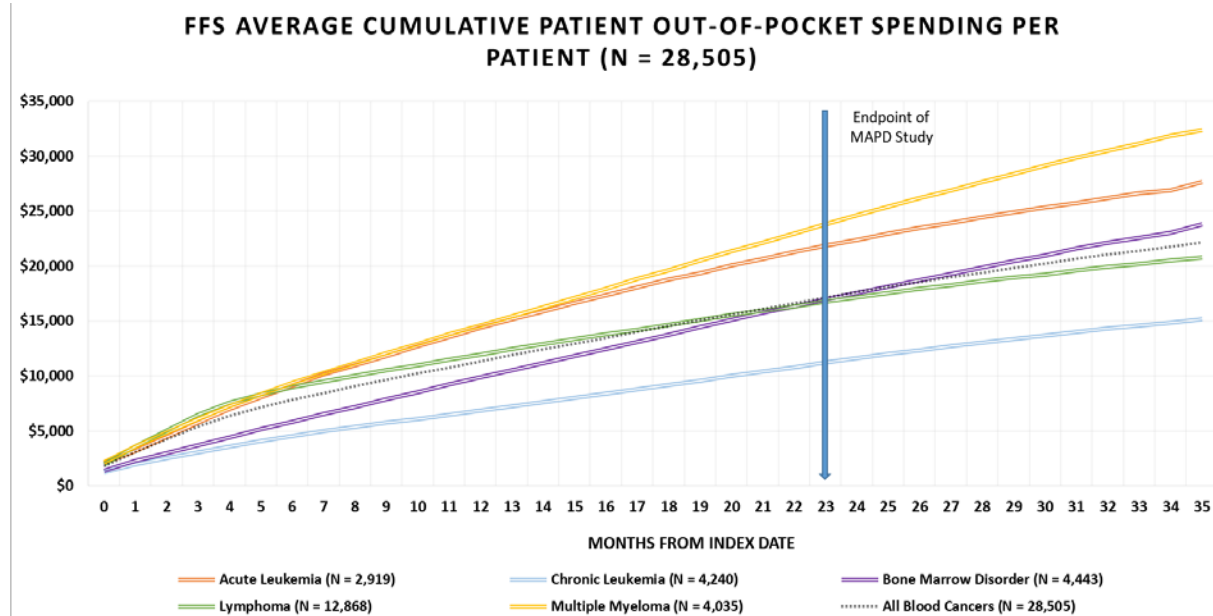
NLI FFS patients incurred more than twice the amount of patient OOP spending as NLI MAPD blood cancer patients (\$17,142 for FFS as compared to \$6,717 for MAPD). After three years, NLI FFS patients incurred an average cumulative \$22,154 in patient OOP spending.

FIGURE 11A: AVERAGE CUMULATIVE PATIENT OUT-OF-POCKET COSTS PER INCIDENT BLOOD CANCER PATIENT - MAPD



Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees
 Patient out-of-pocket spending reflects amounts paid for healthcare services by the patient including deductibles, copays, and coinsurance.

FIGURE 11B: AVERAGE CUMULATIVE PATIENT OUT-OF-POCKET COSTS PER INCIDENT BLOOD CANCER PATIENT - FFS



Source: 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries
 Patient out-of-pocket spending reflects amounts paid for healthcare services by the patient including deductibles, copays, and coinsurance.

As of the end of the second year, month 23, acute leukemia and multiple myeloma patients on average incur the most patient OOP spending among NLI blood cancer patients (FFS: \$23,828 for multiple myeloma and \$21,852 for acute leukemia; MAPD: \$9,936 for multiple myeloma and \$7,644 for acute leukemia). Chronic leukemia was the least costly cancer type in terms of patient OOP spending, with NLI FFS patients incurring an average

\$11,224 during the two years following diagnosis (\$15,140 after three years) and NLI MAPD patients incurring \$4,379 on average during the two years following diagnosis.

Figure 12 provides a comparison of NLI MAPD monthly average patient OOP spending to NLI FFS at month of diagnosis, and subsequent available years following diagnosis. NLI FFS patients persistently incur more patient OOP spending, with the largest difference occurring among NLI FFS acute leukemia patients who after one year incur 185% more and after two years two years incur 186% on average more than NLI MAPD patients.

FIGURE 12: COMPARISON OF MAPD AND FFS PATIENT OUT-OF-POCKET SPENDING

Average Spending per Patient	MAPD	FFS	FFS/MAPD
All Blood Cancers			
Month of diagnosis	\$992	\$1,816	1.83
Cumulative Year 1	\$4,496	\$10,787	2.40
Cumulative Year 2	\$6,717	\$17,142	2.55
Cumulative Year 3	N/A	\$22,154	N/A
Acute Leukemia			
Month of diagnosis	\$1,065	\$2,078	1.95
Cumulative Year 1	\$4,767	\$13,574	2.85
Cumulative Year 2	\$7,644	\$21,852	2.86
Cumulative Year 3	N/A	\$27,657	N/A
Chronic Leukemia			
Month of diagnosis	\$588	\$1,268	2.16
Cumulative Year 1	\$2,881	\$6,492	2.25
Cumulative Year 2	\$4,379	\$11,224	2.56
Cumulative Year 3	N/A	\$15,140	N/A
Bone Marrow Disorder			
Month of diagnosis	\$623	\$1,409	2.26
Cumulative Year 1	\$4,494	\$9,214	2.05
Cumulative Year 2	\$7,452	\$16,970	2.28
Cumulative Year 3	N/A	\$23,784	N/A
Lymphoma			
Month of diagnosis	\$1,201	\$1,976	1.64
Cumulative Year 1	\$4,640	\$11,507	2.48
Cumulative Year 2	\$6,505	\$16,793	2.58
Cumulative Year 3	N/A	\$20,800	N/A
Multiple Myeloma			
Month of diagnosis	\$938	\$2,144	2.28
Cumulative Year 1	\$5,866	\$13,785	2.35
Cumulative Year 2	\$9,936	\$23,828	2.40
Cumulative Year 3	N/A	\$32,350	N/A

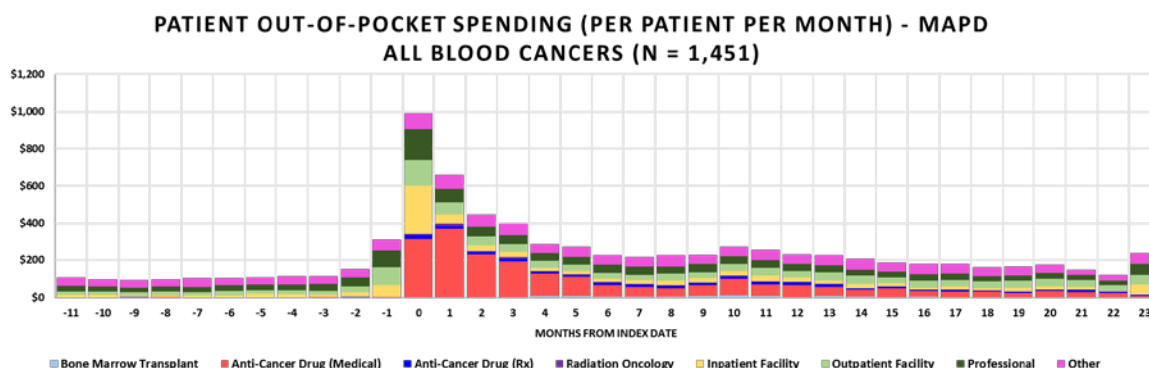
Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries

Patient out-of-pocket spending reflects amounts paid for healthcare services by the patient including deductibles, copays, and coinsurance.

In the previous section, we presented the distribution of monthly allowed spending across service types. Figures 13A and 13B provide patient OOP spending by services over time. As with allowed spending, month of diagnosis incurs the highest cost with NLI MAPD patients incurring an average \$1,036 and NLI FFS patients incurring an average \$1,816. Non-chemotherapy inpatient admissions and Part B medical anticancer drug therapy are the

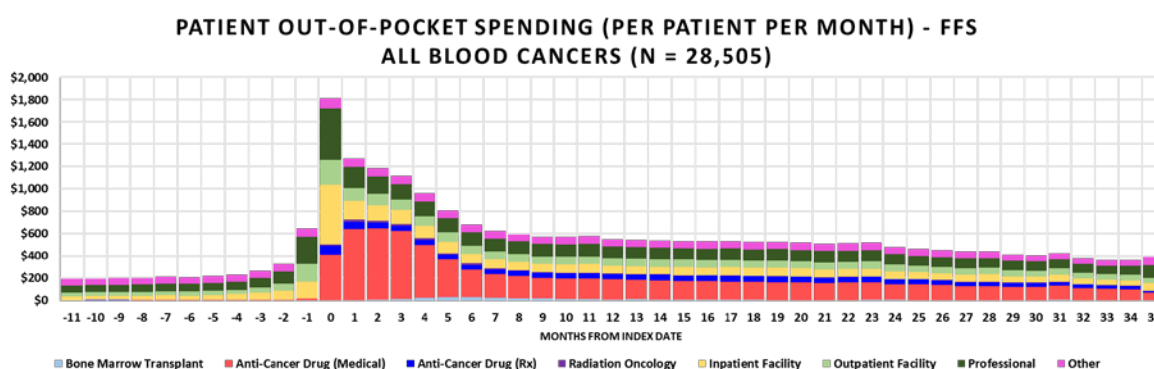
largest drivers of patient OOP spending in the month of diagnosis. In later months, Part B medical anticancer drug therapy persists as the largest or among the largest contributors to patient OOP spending.

FIGURE 13A: MAPD PATIENT OUT-OF-POCKET SPENDING PER BLOOD CANCER PATIENT PER MONTH, BY TYPE OF SERVICE (2015-2016)



Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees
Patient out-of-pocket spending reflects amounts paid for healthcare services by the patient including deductibles, copays, and coinsurance.

FIGURE 13B: FFS PATIENT OUT-OF-POCKET SPENDING PER BLOOD CANCER PATIENT PER MONTH, BY TYPE OF SERVICE (2015-2017)



Source: 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries
Patient out-of-pocket spending reflects amounts paid for healthcare services by the patient including deductibles, copays, and coinsurance.

Appendix C provides monthly patient OOP spending for each cancer type. Key takeaways from this analysis are as follows:

- Acute leukemia and multiple myeloma patients incur the most patient OOP spending.** In month of diagnosis, NLI FFS acute leukemia patients incur \$2,078 and NLI MAPD patients incur \$1,065. In the same month, multiple myeloma NLI FFS patients incur \$2,144 and NLI MAPD patients incur \$928. In contrast, chronic leukemia and bone marrow disorder are the least costly, with \$588 and \$623 OOP spend for NLI MAPD patients in the month of diagnosis respectively and \$1,268 and \$1,409 OOP spend for NLI FFS patients in the month of diagnosis respectively.
- While anticancer drug therapy drives patient OOP spending, most cancer cohorts incur higher patient OOP spending on Part B anticancer drug therapies compared to Part D anticancer drug therapies.** Figure 14 below compares MAPD and FFS average patient OOP spending on Part B Medical and Part D anticancer drug therapy. Multiple myeloma patients report the highest OOP costs on Part D anticancer drug therapy with a monthly average of \$348 for NLI FFS and \$327 for NLI MAPD in the month of diagnosis. In contrast, other cancers incur far more OOP cost on medical Part B

anticancer therapy with acute leukemia being the most costly in month of diagnosis with \$410 for NLI FFS and \$316 for NLI MAPD.

The monthly comparison of average monthly costs is provided in Figure 14 below. Similar to the findings of the monthly allowed spending analysis (**Figure 10**), FFS patients reported higher average monthly costs on inpatient facility admissions. FFS patients also reported higher average monthly OOP spending on outpatient facility encounters and anticancer drug therapy services, a finding that persisted across cancer types and for overall monthly average costs across all services.

FIGURE 14: A COMPARISON OF MAPD TO FFS AVERAGE MONTHLY PATIENT OUT-OF-POCKET SPENDING BY SERVICE TYPE

Monthly Patient Allowed Spending	Inpatient Facility		Outpatient Facility		Anticancer Drug Therapy (Parts B and D)		All Other		Total		
	MAPD	FFS	MAPD	FFS	MAPD	FFS	MAPD	FFS	MAPD	FFS	FFS / MAPD
All Blood Cancers											
Month of Diagnosis	\$259	\$531	\$138	\$221	\$335	\$492	\$260	\$572	\$992	\$1,816	1.83
Year 1 Monthly Average*	\$27	\$103	\$40	\$84	\$150	\$309	\$115	\$341	\$332	\$837	2.52
Year 2 Monthly Average	\$18	\$70	\$38	\$66	\$52	\$213	\$87	\$181	\$195	\$530	2.71
Acute Leukemia											
Month of Diagnosis	\$561	\$805	\$83	\$152	\$181	\$379	\$241	\$743	\$1,065	\$2,078	1.95
Year 1 Monthly Average*	\$32	\$141	\$48	\$118	\$152	\$420	\$122	\$394	\$355	\$1,072	3.02
Year 2 Monthly Average	\$42	\$107	\$42	\$96	\$100	\$268	\$118	\$227	\$302	\$698	2.31
Chronic Leukemia											
Month of Diagnosis	\$177	\$480	\$106	\$140	\$96	\$220	\$208	\$428	\$588	\$1,268	2.16
Year 1 Monthly Average*	\$23	\$78	\$27	\$60	\$75	\$153	\$87	\$188	\$213	\$480	2.26
Year 2 Monthly Average	\$12	\$60	\$22	\$54	\$13	\$131	\$71	\$149	\$118	\$394	3.33
Bone Marrow Disorder											
Month of Diagnosis	\$170	\$574	\$71	\$129	\$157	\$279	\$225	\$426	\$623	\$1,409	2.26
Year 1 Monthly Average*	\$41	\$140	\$50	\$77	\$119	\$262	\$140	\$235	\$350	\$714	2.04
Year 2 Monthly Average	\$28	\$113	\$48	\$73	\$98	\$232	\$116	\$229	\$290	\$647	2.23
Lymphoma											
Month of Diagnosis	\$246	\$440	\$181	\$304	\$499	\$624	\$275	\$608	\$1,201	\$1,976	1.64
Year 1 Monthly Average*	\$21	\$88	\$38	\$87	\$166	\$303	\$107	\$416	\$332	\$895	2.69
Year 2 Monthly Average	\$15	\$57	\$36	\$61	\$36	\$153	\$79	\$171	\$167	\$441	2.64
Multiple Myeloma											
Month of Diagnosis	\$242	\$628	\$117	\$195	\$267	\$675	\$313	\$646	\$938	\$2,144	2.28
Year 1 Monthly Average*	\$41	\$125	\$50	\$95	\$212	\$514	\$153	\$340	\$456	\$1,074	2.36
Year 2 Monthly Average	\$20	\$74	\$62	\$79	\$118	\$487	\$107	\$197	\$307	\$837	2.72

* Summary of 11 months following but not including month of diagnosis

Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries

Patient out-of-pocket spending reflects amounts paid for healthcare services by the patient including deductibles, copays, and coinsurance.

II.c. Newly diagnosed blood cancer patients receiving anticancer therapy within 90 days of index diagnosis - Allowed Spending

Despite receiving a blood cancer diagnosis, not every patient chooses or is a candidate for traditional anticancer therapies, including anticancer drug therapy, bone marrow/stem cell transplants, and radiation oncology therapy. Figure 15 compares the rate at which newly diagnosed blood cancer patients receive any of these types of treatments within 90 days of diagnosis, among patients who survive 90 days post diagnosis index date. Overall, 45% of MAPD and 41% of FFS surviving blood cancer patients receive treatment in this timeframe. Chronic leukemia reported the lowest treatment rates in this timeframe, 24% for MAPD and 22% for FFS patients. Multiple myeloma patients reported the highest treatment rates with 59% for MAPD and 58% for FFS. We did not observe statistically meaningful differences in treatment rates between MAPD and FFS. A sensitivity analysis

expanding the time period to 180 days following diagnosis did not produce meaningfully different results. It is important to note that some patients who were identified as non-treated still incur costs on either adjuvant care, such as blood transfusions, or novel therapies by way of clinical trials that are not readily identifiable in the data.

FIGURE 15: COMPARISON OF MAPD TO FFS TREATMENT RATES WITHIN 90 DAYS OF INDEX DIAGNOSIS

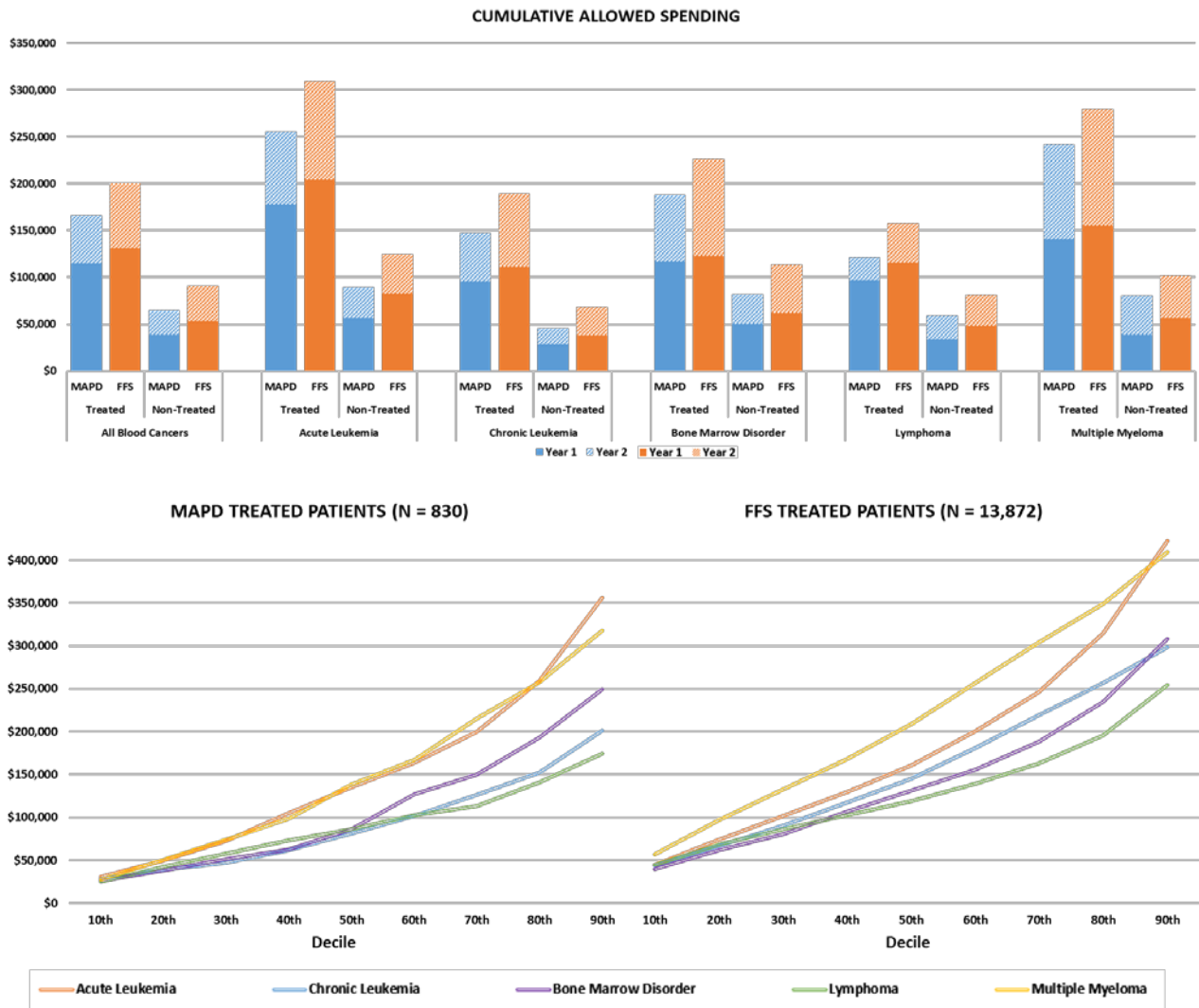
Cancer Type	Treated				Non-Treated			
	MAPD		FFS		MAPD		FFS	
	Patient Count	%	Patient Count	%	Patient Count	%	Patient Count	%
Acute Leukemia	76	52%	1,358	49%	69	48%	1,399	51%
Chronic Leukemia	62	24%	1,082	22%	198	76%	3,796	78%
Bone Marrow Disorder	45	19%	777	15%	191	81%	4,460	85%
Lymphoma	446	54%	7,508	50%	374	46%	7,420	50%
Multiple Myeloma	154	59%	2,711	58%	108	41%	1,933	42%
Total	783	45%	13,436	41%	940	55%	19,008	59%

Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries

Treated patients received anticancer drug therapy, radiation oncology therapy, or stem cell/bone marrow transplants within 90 days of diagnosis. Patients were required to have at least three months of continuous coverage after their diagnosis date.

Figure 16 compares the cumulative per patient allowed spending for patients who do receive active treatment within the first 90 days to those who do not receive treatment (refer to Appendix D, Figure D1 for decile details). Across all blood cancers, patients who are treated incur on average between 2.5 (MAPD) and 3 times (FFS) more in allowed spending in the first year following diagnosis and between 2.2 (MAPD) and 2.5 times (FFS) more during the second year. The FFS blood cancer patients have consistently higher allowed costs for treated and untreated patients compared to the MAPD blood cancer patients.

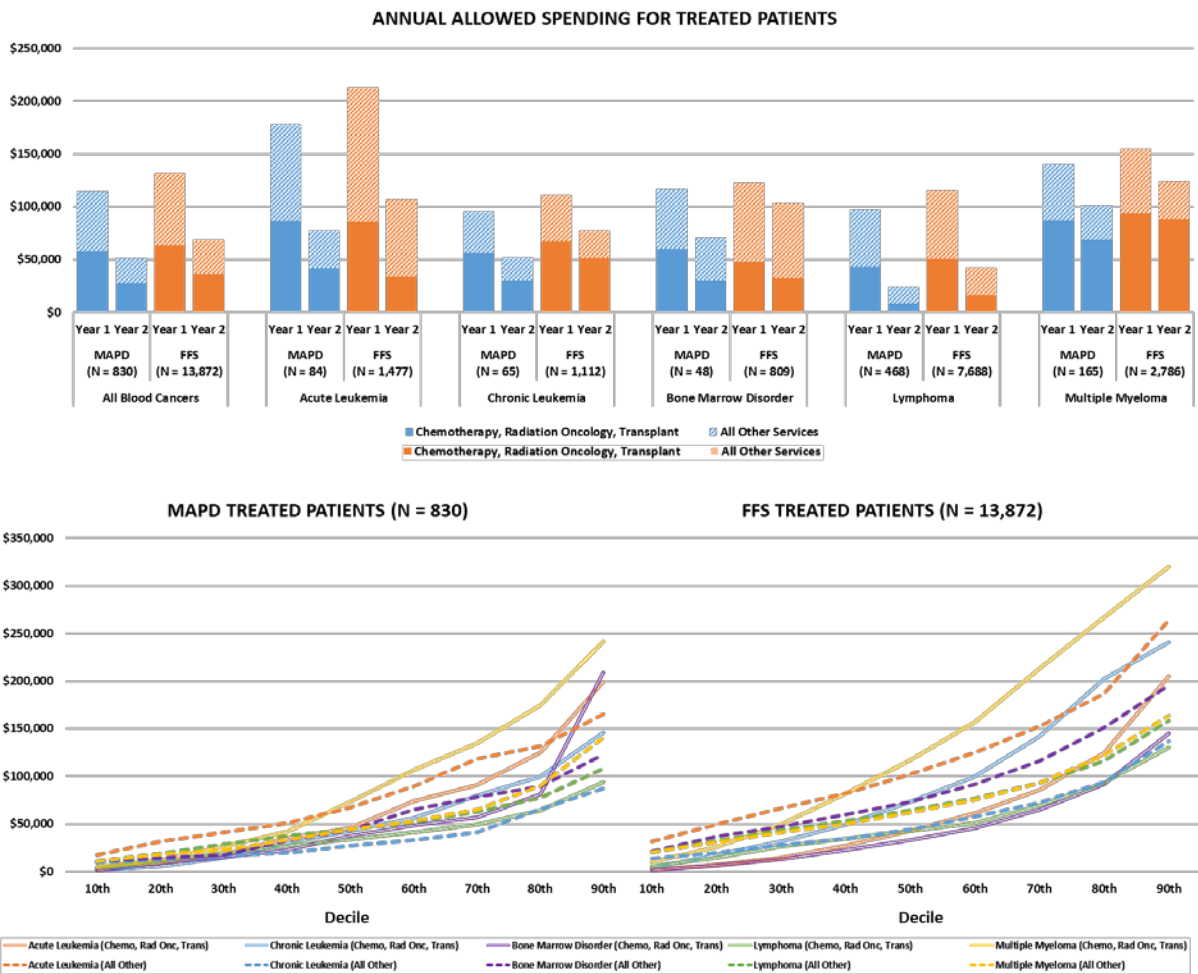
FIGURE 16: MAPD AND FFS CUMULATIVE ALLOWED SPENDING – COMPARISON OF TREATED AND NON-TREATED POPULATION



Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries
 Allowed spending includes the amounts paid for healthcare services by both payer and patient combined.
 Treated patients received anticancer drug therapy, radiation oncology therapy, or stem cell/bone marrow transplants within 90 days of diagnosis.
 No continuous coverage requirements were applied.

Figure 17 provides the cost contribution of anticancer therapies to total allowed spending (refer to Appendix D, Figure D2 for decile details). This graph reports the average annual cumulative allowed spending per treated patient in years 1 and 2 following diagnosis. In the first year following diagnosis, anticancer treatments contribute almost half of total allowed spending across all blood cancers.

FIGURE 17: COMPARISON OF MAPD TO FFS ANNUAL ALLOWED SPENDING FOR TREATED PATIENTS

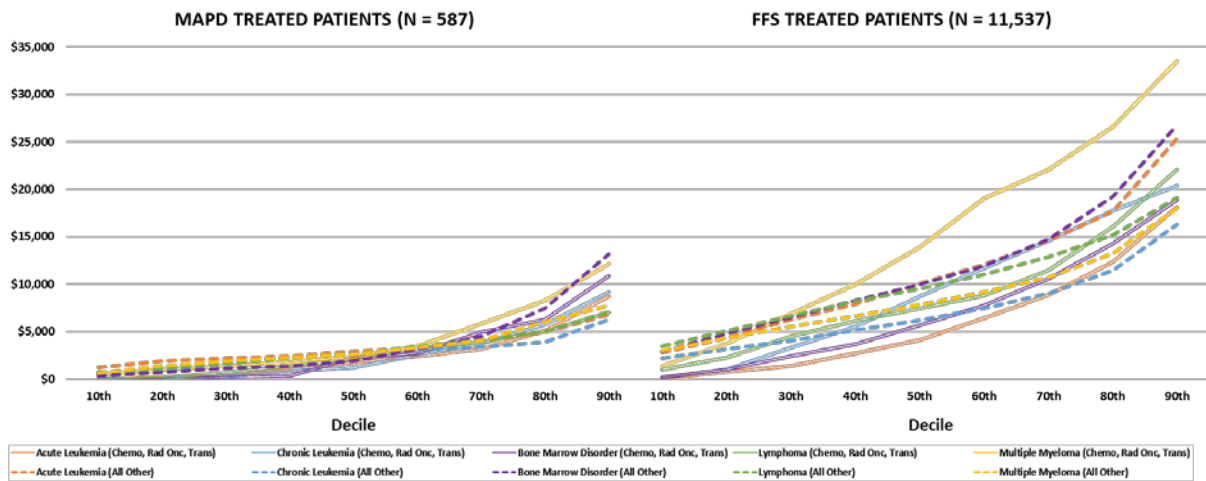
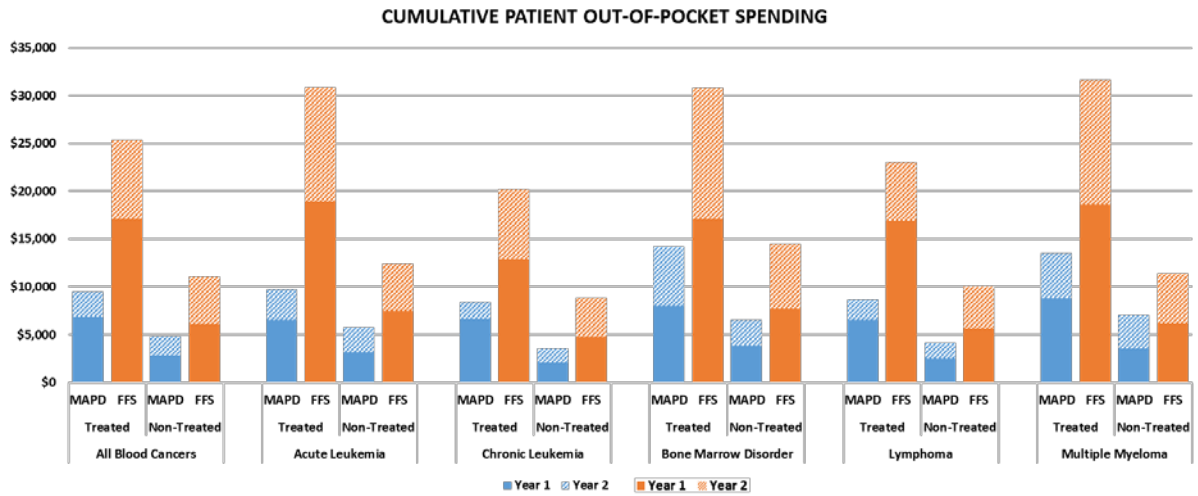


Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries
 Allowed spending includes the amounts paid for healthcare services by both payer and patient combined.
 Treated patients received anticancer drug therapy, radiation oncology therapy, or stem cell/bone marrow transplants within 90 days of diagnosis.
 No continuous coverage requirements were applied.

II.d. Newly diagnosed blood cancer patients receiving anticancer therapy within 90 days of index diagnosis - OOP Spending

In a previous section, we noted that FFS patients pay more on average in OOP spending than MAPD patients. This difference is more evident among treated patients. Figure 18 compares the cumulative OOP spending in the two years following diagnosis (refer to Appendix E, Figure E1 for decile details).

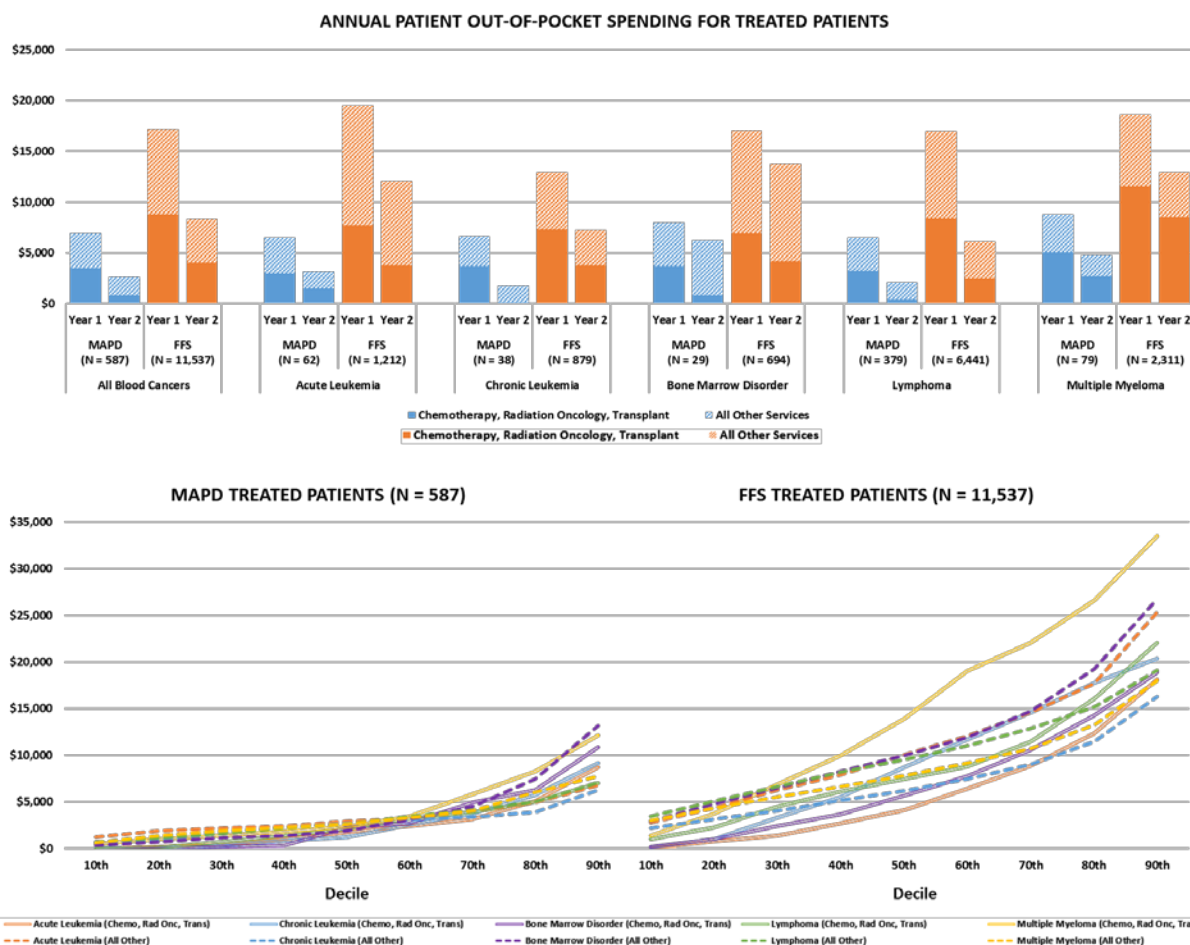
FIGURE 18: MAPD AND FFS CUMULATIVE PATIENT OUT-OF-POCKET SPENDING IN YEARS 1 AND 2 FOLLOWING DIAGNOSIS – COMPARISON OF TREATED AND NON-TREATED POPULATION



Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries
 Patient out-of-pocket spending reflects amounts paid for healthcare services by the patient including deductibles, copays, and coinsurance. Treated patients received anticancer drug therapy, radiation oncology therapy, or stem cell/bone marrow transplants within 90 days of diagnosis. No continuous coverage requirements were applied.

Similar to Figure 18, Figure 19 presents anticancer therapy cost contribution to total patient OOP costs in years 1 and 2 following diagnosis (refer to Appendix E, Figure E2 for decile details). Anticancer therapy contributes a similar amount to patient OOP spending as noted for allowed spending. Across all blood cancers, treated MAPD patients' anticancer therapy contributes 52% to allowed spending compared to 45% for patient OOP costs. Treated FFS patients' anticancer therapy contributes 50% to allowed costs compared to 50% for patient OOP costs.

FIGURE 19: COMPARISON OF MAPD TO FFS ANNUAL PATIENT OUT-OF-POCKET SPENDING FOR TREATED PATIENTS IN YEARS 1 AND 2 FOLLOWING DIAGNOSIS



Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries
 Patient out-of-pocket spending reflects amounts paid for healthcare services by the patient including deductibles, copays, and coinsurance.
 Treated patients received anticancer drug therapy, radiation oncology therapy, or stem cell/bone marrow transplants within 90 days of diagnosis.
 No continuous coverage requirements were applied.

II.e. Newly diagnosed blood cancer patients receiving anticancer drug agents within 90 days of diagnosis - Allowed Spending

Anticancer drug therapy was the most utilized anticancer therapy among treated patients (93% of MAPD and 92% of FFS patients who receive anticancer therapy in the first 90 days following diagnosis). Anticancer drug therapy allowed spending is incurred for services beyond chemotherapy, immunotherapy and hormonal agents, including administration costs, antiemetic, hematopoietic, and adjuvant (including blood transfusion) therapies. The majority of these costs are paid through the medical Part B benefit. For patients who received anticancer drug agents during the first 90 days following diagnosis, we summarized the average allowed costs per patient per year for each of these components. In Figure 20, we summarize average allowed costs per blood cancer patient per year. We calculated average allowed costs for Part B anticancer drug therapy for patients who receive medical Part B anticancer drug agents within 90 days, average allowed costs for Part D anticancer drug therapy for those that receive prescription drug Part D anticancer drug agents, and average allowed costs for both Part B and Part D anticancer drug therapy for those who receive both within 90 days. These cohorts are not mutually exclusive. We additionally report how much anticancer drug therapy contributes to average total allowed costs and we provide average months of exposure and average months reporting anticancer drug therapy claims for the contributing populations.

FIGURE 20: PER PATIENT PER YEAR (PPY) ANTICANCER DRUG THERAPY ALLOWED SPENDING (12 MONTHS AFTER DIAGNOSIS)

Patient Cohort	MAPD		FFS	
	Patient Count	%	Patient Count	%
Patients with Only Part B Anticancer Agents*	590	31.1%	9,791	27.3%
Patients with Only Part D Anticancer Agents*	100	5.3%	1,753	4.9%
Patients with Part B and Part D Anticancer Agents*	82	4.3%	1,215	3.4%
Patients with No Anticancer Agents*	1,126	59.3%	23,118	64.4%
Total Patient Population	1,898	100.0%	35,877	100.0%

	Patients with any Part B Anticancer Agents*		Patients with any Part D Anticancer Agents*		Patients with Part B and Part D Anticancer Agents*			
	MAPD	FFS	MAPD	FFS	MAPD		FFS	
	Part B	Part B	Part D	Part D	Part B	Part D	Part B	Part D
Patient Count	672	11,006	182	2,968	82		1,215	
% of Patient Population	35.4%	30.7%	9.6%	8.3%	4.3%		3.4%	
Avg. Months of Exposure in Year	9.9	10.6	10.2	10.6	10.4		10.9	
Avg. Months with an Anticancer Agent Claim	5.3	5.8	6.9	7.2	8.2		8.5	
Anticancer Drug Therapy:								
Part B Anticancer Agents	\$37,832	\$37,489	N/A	N/A	\$34,309	N/A	\$33,083	N/A
Part D Anticancer Agents	N/A	N/A	\$58,420	\$68,484	N/A	\$57,546	N/A	\$58,288
Chemotherapy DRG Inpatient Admits	\$3,824	\$7,235	N/A	N/A	\$5,937	N/A	\$5,679	N/A
Hematopoietic Agents	\$8,271	\$8,413	\$173	\$684	\$1,777	\$365	\$2,474	\$897
Adjuvant Therapies	\$2,268	\$3,589	\$27	\$14	\$1,732	\$34	\$2,934	\$16
Drug Administration	\$3,207	\$3,294	N/A	N/A	\$2,097	N/A	\$2,651	N/A
Anti-emetics	\$717	\$779	\$84	\$112	\$91	\$134	\$225	\$125
Anticancer Sub-Total	\$56,119	\$60,799	\$58,704	\$69,294	\$45,942	\$58,079	\$47,045	\$59,326
Remaining Anticancer Spending**	\$8,931	\$10,158	\$23,438	\$23,792	N/A	N/A	N/A	N/A
Total Anticancer Spending	\$65,050	\$70,957	\$82,141	\$93,086	\$104,021		\$106,371	
Total Across All Services	\$120,585	\$137,313	\$141,364	\$156,226	\$183,915		\$187,191	
% Anticancer Drug Therapy	53.9%	51.7%	58.1%	59.6%	56.6%		56.8%	

Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries

Allowed spending includes the amounts paid for healthcare services by both payer and patient combined.

*Summaries based on patients who receive anticancer drug therapy within the first 90 days following diagnosis. Chemotherapy treatment includes "Part B Anticancer Agents", "Part D Anticancer Agents", and "Inpatient Admits with Chemotherapy DRGs". Patients in cohorts are not mutually exclusive.

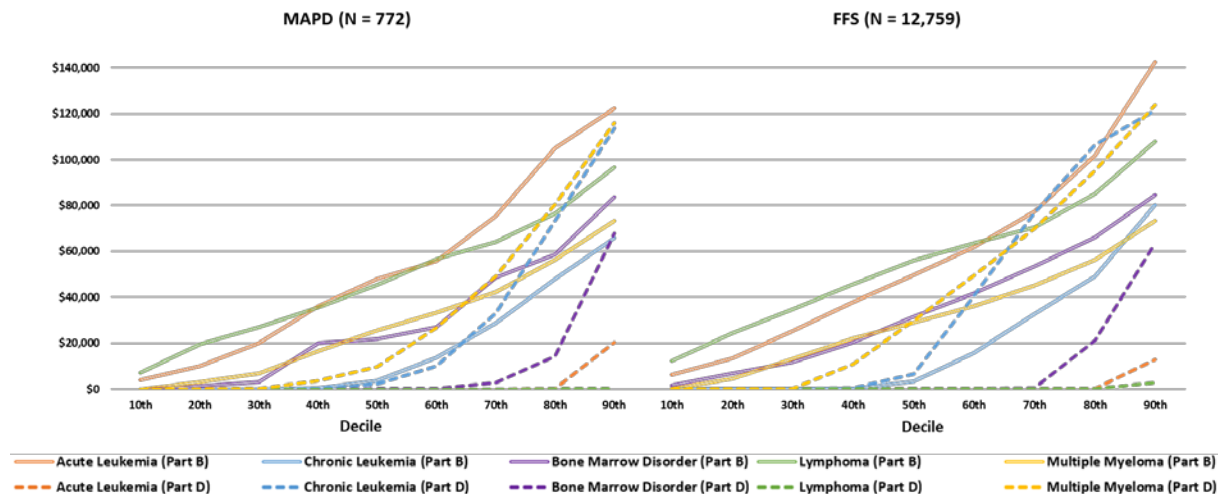
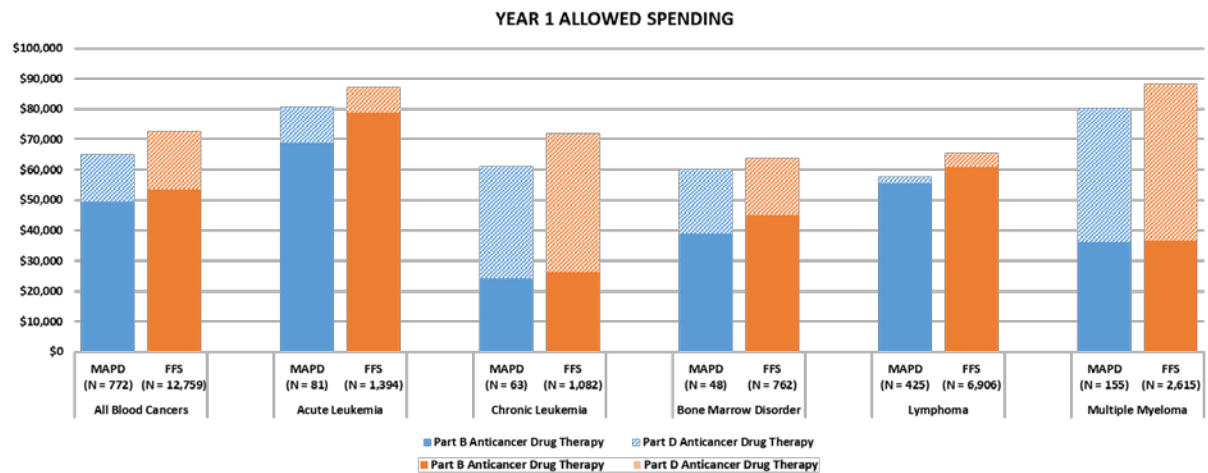
**Remaining anticancer spending includes Part D anticancer drug therapies for the patient cohort with any Part B anticancer agents and Part B anticancer drug therapies for the patient cohort with any Part D anticancer agents.

Anticancer drug therapy contributes 54% for MAPD and 52% for FFS to total allowed spending among those patients who utilize Part B anticancer drug agents. Anticancer drug therapy contributes more to average allowed spending among patients who utilize Part D anticancer drugs - 58% for MAPD and 60% for FFS. FFS patients receiving anticancer drug therapy incur more allowed costs on anticancer drug therapies when compared to MAPD (MAPD: \$65,050 vs FFS: \$70,957 for patients who are administered Part B anticancer drug agents; and MAPD: \$82,141 vs FFS: \$93,086 for patients who are administered Part D anticancer drug agents). The majority of these costs are contributed by the anticancer agent. FFS patients incur allowed costs that are similar to MAPD patients for Part B medical anticancer agents (\$37,489 and \$37,832 respectively), but higher costs than MAPD for Part D therapies (\$68,484 vs \$58,420).

Figure 21A and 21B present the average allowed costs on anticancer drug therapy per patient per year in the first and second year following diagnosis for patients who incur anticancer drug therapy in the first 90 days after index diagnosis (refer to Appendix D, Figures D3 and D4 for decile details). We provide separate findings for each cancer type. FFS patients incur more allowed costs on anticancer drug therapy across all cancer types compared to MAPD patients.

In addition we provide the distribution of anticancer drug therapy costs by decile. The distribution shows the very high costs a portion of each cancer type cohort incurs.

FIGURE 21A: PER PATIENT PER YEAR (PPY) ANTICANCER DRUG THERAPY ALLOWED SPENDING (YEAR 1 FOLLOWING DIAGNOSIS) – BY CANCER TYPE

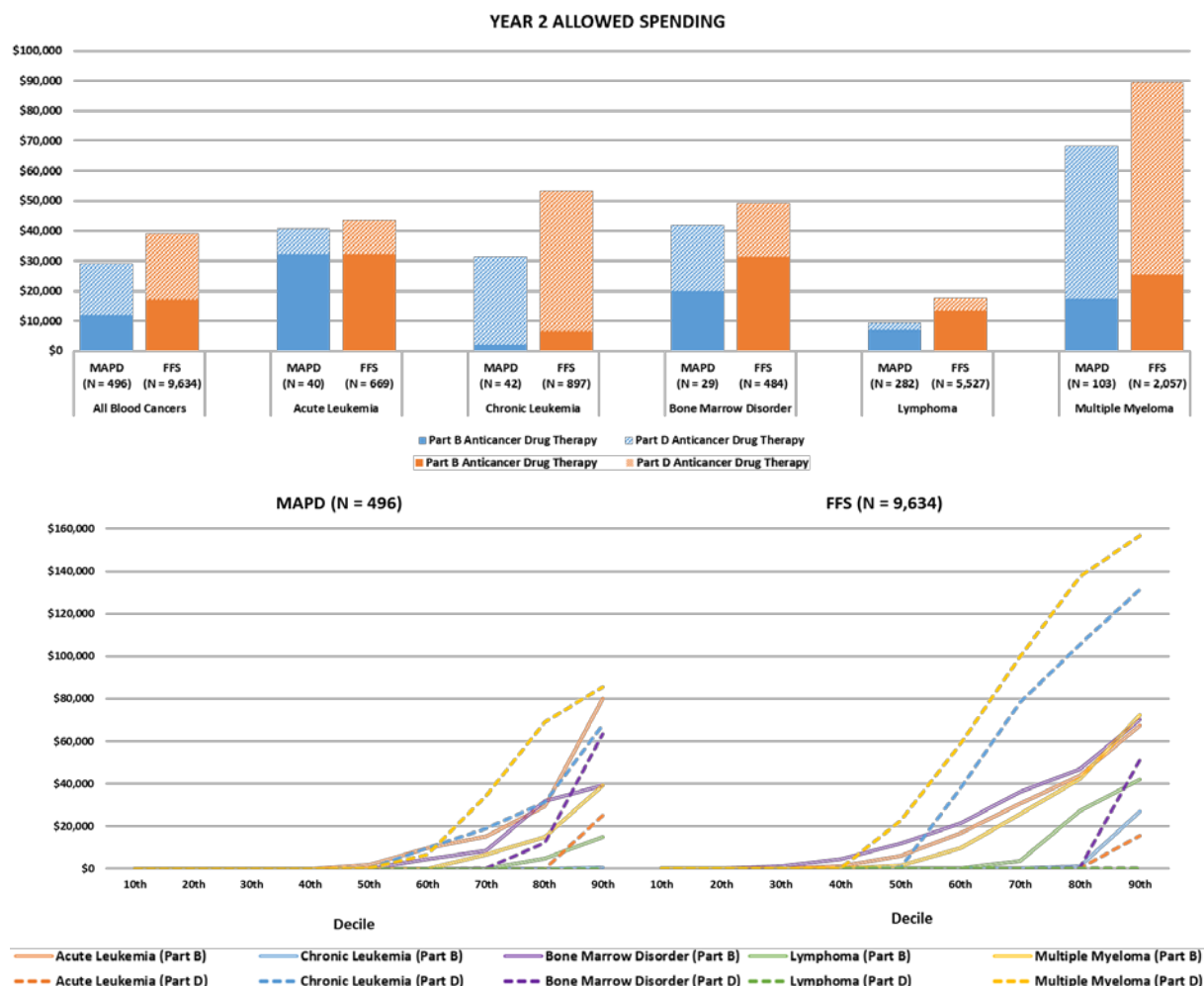


Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries

Allowed spending includes the amounts paid for healthcare services by both payer and patient combined.

Summaries based on patients who receive anticancer drug agents within the first 90 days following diagnosis. Anticancer drug agents include "Part B Anticancer Agents", "Part D Anticancer Agents", and "Chemotherapy DRG Inpatient Admits".

FIGURE 21B: PER PATIENT PER YEAR (PPY) ANTICANCER DRUG THERAPY ALLOWED SPENDING (YEAR 2 FOLLOWING DIAGNOSIS) – BY CANCER TYPE



Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries

Allowed spending includes the amounts paid for healthcare services by both payer and patient combined.

Summaries based on patients who receive anticancer drug agents within the first 90 days following diagnosis. Anticancer drug agents include "Part B Anticancer Agents", "Part D Anticancer Agents", and "Chemotherapy DRG Inpatient Admits".

II.f. Newly diagnosed blood cancer patients receiving anticancer DRUG therapy within 90 days of diagnosis - OOP Spending

We performed a similar comparison across the individual components of anticancer drug therapy for average patient OOP spending, excluding the LI FFS and MAPD population. **(Figure 22)** FFS patients pay more on average for anticancer drug therapy, particularly Part B anticancer drug therapy, than MAPD patients. For Part B anticancer drug utilizers, NLI MAPD patients accrued almost \$3,105 of patient OOP costs as compared to \$7,477 paid by NLI FFS utilizing patients. FFS patients accrued almost two times more OOP costs for Part D anticancer drug therapy than MAPD patients - \$4,767 for FFS vs \$2,117 for MAPD.

FIGURE 22: PER PATIENT PER YEAR (PPY) ANTICANCER DRUG THERAPY PATIENT OUT-OF-POCKET SPENDING (YEAR 1 FOLLOWING DIAGNOSIS)

Patient Cohort [†]	MAPD		FFS	
	Patient Count	%	Patient Count	%
Patients with Only Part B Anticancer Agents*	482	33.2%	8,231	28.9%
Patients with Only Part D Anticancer Agents*	34	2.3%	1,399	4.9%
Patients with Part B and Part D Anticancer Agents*	23	1.6%	995	3.5%
Patients with No Anticancer Agents*	912	62.9%	17,880	62.7%
Total Patient Population	1,451	100.0%	28,505	100.0%

	Patients with any Part B Anticancer Agents*		Patients with any Part D Anticancer Agents*		Patients with Part B and Part D Anticancer Agents*			
	MAPD	FFS	MAPD	FFS	MAPD		FFS	
	Part B	Part B	Part D	Part D	Part B	Part D	Part B	Part D
Patient Count	505	9,226	57	2,394	23		995	
% of Patient Population	34.8%	32.4%	3.9%	8.4%	1.6%		3.5%	
Avg. Months of Exposure in Year	9.7	10.7	9.9	10.7	9.8		10.9	
Avg. Months with an Anticancer Agent Claim	5.1	5.8	5.4	7.2	6.8		8.6	
Anticancer Drug Therapy:								
Part B Anticancer Agents	\$3,105	\$7,477	N/A	N/A	\$2,591	N/A	\$6,977	N/A
Part D Anticancer Agents	N/A	N/A	\$2,117	\$4,767	N/A	\$2,421	N/A	\$4,176
Chemotherapy DRG Inpatient Admits	\$104	\$138	N/A	N/A	\$292	N/A	\$63	N/A
Hematopoietic Agents	\$599	\$1,743	\$17	\$23	\$80	\$23	\$496	\$35
Adjuvant Therapies	\$52	\$486	\$8	\$4	\$0	\$10	\$351	\$5
Drug Administration	\$229	\$660	N/A	N/A	\$90	N/A	\$549	N/A
Anti-emetics	\$62	\$154	\$18	\$18	\$7	\$34	\$51	\$25
Anticancer Sub-Total	\$4,151	\$10,658	\$2,159	\$4,813	\$3,059	\$2,488	\$8,486	\$4,240
Remaining Anticancer Spending**	\$216	\$761	\$1,448	\$4,391	N/A	N/A	N/A	N/A
Total Anticancer Spending	\$4,367	\$11,418	\$3,607	\$9,204	\$5,547		\$12,726	
Total Across All Services	\$7,292	\$18,660	\$6,399	\$15,745	\$8,803		\$20,558	
% Anticancer Drug Therapy	59.9%	61.2%	56.4%	58.5%	63.0%		61.9%	

Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries

Patient out-of-pocket spending reflects amounts paid for healthcare services by the patient including deductibles, copays, and coinsurance.

*Summaries based on patients who receive anticancer drug agents within the first 90 days following diagnosis. Anticancer drug agents include "Part B Anticancer Agents", "Part D Anticancer Agents", and "Chemotherapy DRG Inpatient Admits". Patients in cohorts are not mutually exclusive.

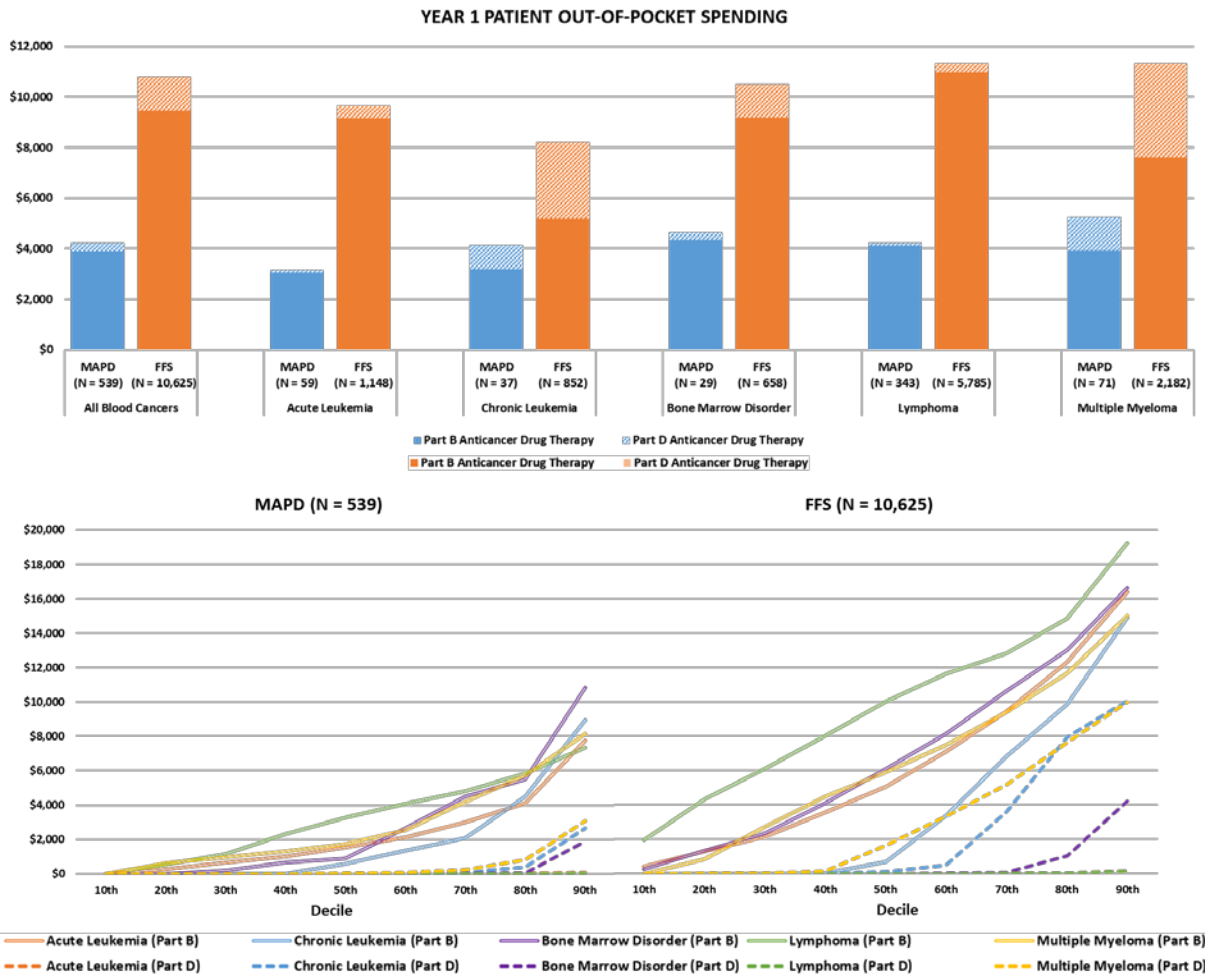
**Remaining anticancer spending includes Part D anticancer drug therapies for the patient cohort with any Part B anticancer agents and Part B anticancer drug therapies for the patient cohort with any Part D anticancer agents.

†The patient cohort for patient out-of-pocket spending differs from the patient cohort for allowed spending due to the omission of LIS patients from the out-of-pocket analysis.

For Part B anticancer drug utilizers, anticancer drug therapy contributes more, as a percentage of total OOP spending, than it does to total allowed spending (59.9% MAPD/61.2% FFS for patient OOP vs 53.9% MAPD/51.7% FFS for allowed spending). Figures 23A and 23B presents the annual allowed spending per patient accrued on anticancer drug therapy (see Appendix E, Figures E3 and E4 for decile details). Part B anticancer drug therapy drives the majority of patient out-of-pocket spending across cancer types related to anticancer drug therapy. The FFS OOP spend for these service is also consistently and substantially higher than MAPD across cancer types.

In addition we provide the distribution of anticancer drug therapy costs by decile. The distribution shows the very high costs a portion of each cancer type cohort incurs.

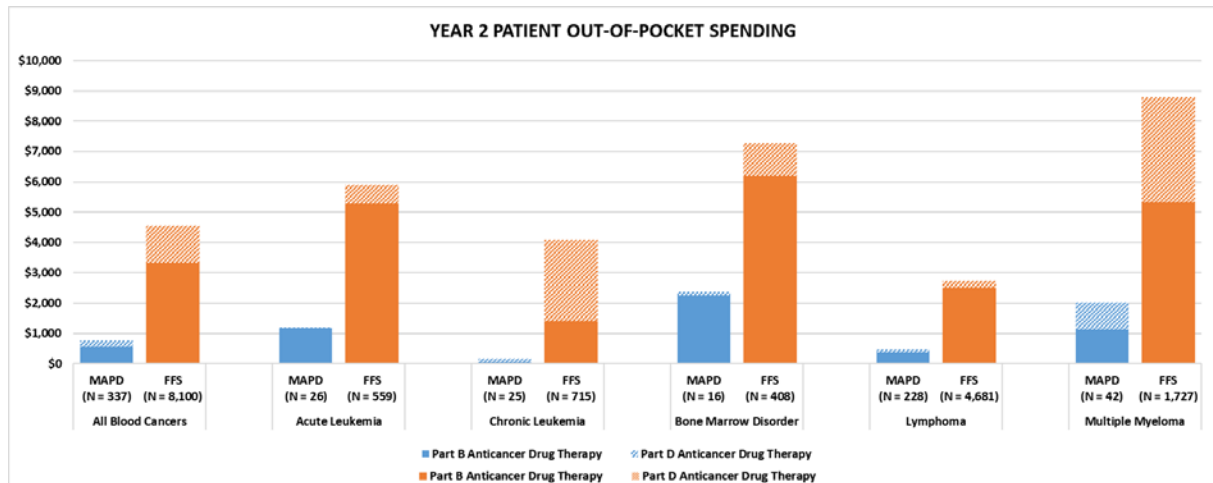
FIGURE 23A: PER PATIENT PER YEAR (PPY) ANTICANCER DRUG THERAPY PATIENT OUT-OF-POCKET SPENDING (FIRST 12 MONTHS AFTER DIAGNOSIS) – BY CANCER TYPE

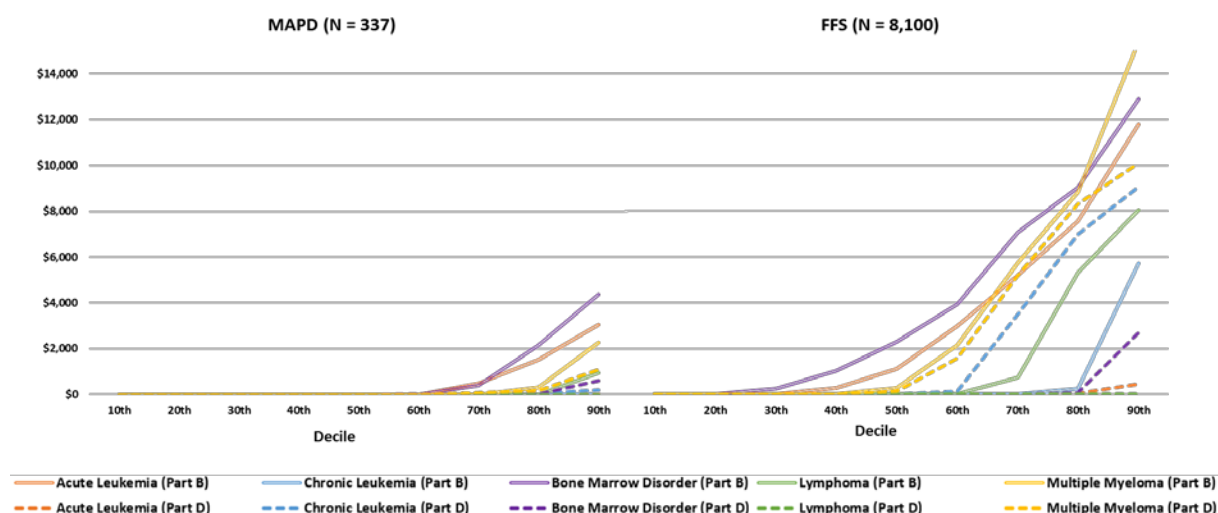


Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries

Patient out-of-pocket spending reflects amounts paid for healthcare services by the patient including deductibles, copays, and coinsurance. Summaries based on patients who receive anticancer drug agents within the first 90 days following diagnosis. Anticancer drug agents include "Part B Anticancer Agents", "Part D Anticancer Agents", and "Chemotherapy DRG Inpatient Admits".

FIGURE 23B: PER PATIENT PER YEAR (PPY) ANTICANCER DRUG THERAPY PATIENT OUT-OF-POCKET SPENDING (SECOND 12 MONTHS AFTER DIAGNOSIS) – BY CANCER TYPE





Source: 2014-2016 Milliman Consolidated data set of MAPD enrollees and 2014-2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries

Patient out-of-pocket spending reflects amounts paid for healthcare services by the patient including deductibles, copays, and coinsurance. Summaries based on patients who receive anticancer drug agents within the first 90 days following diagnosis. Anticancer drug agents include "Part B Anticancer Agents", "Part D Anticancer Agents", and "Chemotherapy DRG Inpatient Admits".

Discussion

Allowed health care spending for newly diagnosed blood cancer care quickly accumulates to high levels for both insurers and patients during the first years after a cancer diagnosis. Allowed spending is particularly high for newly diagnosed blood cancer patients starting active treatment (anticancer drug therapy, radiation oncology services, or bone marrow/stem cell transplants) within the first three months after diagnosis - approximately 45% of the MAPD and 41% of the FFS patient population. The average allowed spending in the first two years following diagnosis for actively treated patients was \$200,409 per FFS patient and \$165,967 per MAPD patient. Allowed spending for patients in year one was around twice the spending incurred in year two (\$131,406 vs \$69,004 for FFS patients and \$114,751 vs \$51,216 for MAPD patients).

While blood cancer patients with Medicare utilize a wide variety of services following diagnosis, allowed spending is largely driven by services associated with anticancer drug therapy. Of those actively treated within 90 days of diagnosis, 92% FFS and 93% MAPD newly diagnosed blood cancer patients received anticancer drug therapy. There is a significantly higher average allowed spending on Part B vs Part D anticancer drug therapy: \$53,524 vs \$19,167 (FFS) and \$49,375 vs \$15,593 (MAPD) in the first year following diagnosis. Some patients incur extremely high costs for drug therapy. At the 90th cost percentile, acute leukemia patients, for example, accrued \$142,570 Part B and \$12,928 Part D (FFS) and \$122,307 Part B and \$20,373 Part D (MAPD) average allowed spending in the first year after diagnosis (**Figure 21A**).

Along with high allowed spending, blood cancer patients incur high OOP costs. Those costs are higher for FFS compared to MAPD patients. Among non-low income, actively treated patients, average OOP costs were \$17,084 in year one and \$8,295 in year two per FFS patient versus \$6,896 in year one and \$2,603 in year two per MAPD patient. Patient OOP spending on anticancer drug therapy during year one was particularly high for FFS vs MAPD - patients incurred an average \$10,796 vs \$4,240 average OOP costs and at the 90th percentile cost percentile, chronic leukemia patients, for example, incurred an average \$14,899 Part B and \$10,076 Part D (FFS) and \$8,942 Part B and \$2,652 Part D (MAPD) (**Figure 23A**). The higher OOP spend for FFS patients is driven by the dynamic that Part B drugs contribute most of the anticancer drug therapy spend and FFS beneficiaries have no OOP maximum for Part B covered services. Medicare Advantage patients are afforded some protection from extreme OOP costs by way of a federally mandated maximum out-of-pocket cap for certain services. Some FFS beneficiaries do have the option to enroll in supplemental insurance, Medigap, to offset out-of-pocket burden, although Medigap issuers in most states are allowed to refuse sale to and medically underwrite premiums for people with pre-existing conditions like cancer. Other FFS beneficiaries have employer sponsored benefits. While we cannot identify enrollment in supplemental insurance in the data used for this analysis, the literature reports that nearly one quarter (23%) of Medicare FFS beneficiaries do not have supplemental

coverage^x. Those newly diagnosed blood cancer patients without supplemental insurance face a significant OOP cost burden. With the reportedly low median income of households with people ages 65 and older (\$38,515 in 2015), such OOP costs can be considerably challenging for many.^{xii}

Federal legislative and regulatory changes have been proposed to address high drug costs incurred by the Medicare program and by Medicare patients which could ease the burden for payers and blood cancer patients. In the interim, the cost burden to both Medicare payers and patients will likely increase as more efficacious novel therapies are introduced and survival of blood cancer patients improves, and the high out-of-pocket burden for Medicare enrollees diagnosed with blood cancer will likely continue.

Limitations

Data limitations inherent to the use of real-world data that might have affected these results include:

- The MAPD results are based on analysis of the 2014-2016 Milliman consolidated database for Medicare Advantage with Part D beneficiaries. The FFS results are based on analysis of the 2014-2017 CMS Innovator Research data. Different data and time periods can produce different results, particularly since new therapies are constantly being introduced. Individual patient experience will likely differ from these population averages. Changes in treatment patterns and technology occurring after these time periods are not captured in these results.
- For MAPD, we observed patients for their duration in the database and did not attempt to identify deaths. In particular, patients requiring hospice are required to transfer to a FFS benefit structure as these benefits are not covered under MAPD plans. It is possible people exiting this database may bias results for this cohort's analysis.
- Care patterns and spending vary significantly by region, so regional healthcare systems may exhibit patterns that vary from these national averages.
- Patient OOP costs summarized in this report reflect the total responsibility of a patient's cost share as per their selected Medicare benefit coverage. Summary of these costs are restricted to NLI beneficiaries since subsidized beneficiaries pay little to none of these costs. Patient OOP costs do not reflect discounts on services such as coupons or rebates, supplemental insurance such as Medigap, or other forms of financial assistance such as Patient Assistance Programs.

Sources and Methodology

DATA SOURCES

Milliman Consolidated Healthcare Database

The Milliman Consolidated Health Cost Guidelines Source Database contains proprietary historical claims experience from several of Milliman's Health Cost Guideline (HCG) data contributors. The database contains annual enrollment and paid medical and pharmacy claims for over 2.8 million individuals covered by Medicare Advantage and Part D. We used three years of data to produce the longitudinal study (2014-2016) and 2017, which became available late into this work, for the annual prevalence analysis. We included patients with continuous medical and pharmacy enrollment from 2014 through January 2015 to allow for a one-year lookback period to identify first diagnosis.

CMS 100% Medicare Research Identifiable Database for Parts A, B, and D

This data set contains all Medicare Parts A, B, and D paid claims incurred by Medicare fee-for-service (FFS) beneficiaries. Information includes county of residence, diagnosis codes, procedure codes, DRG codes, site of service information, beneficiary age, eligibility status and an indicator for HMO enrollment. We used four years of data to produce the longitudinal study (2014-2017) and 2017 for the annual prevalence analysis. We included

patients with continuous medical and pharmacy enrollment from 2014 through January 2015 to allow for a one-year lookback period to identify first diagnosis.

METHODOLOGY

Identification of 2017 prevalent blood cancer patient population

We performed a summary of the prevalent blood cancer population for 2017. The results of this analysis can be found in Appendix F. For these analyses, we identified patients who reported a blood cancer diagnosis in 2017. Cancer patients were required to meet the following conditions:

- Continuous enrollment in Parts A, B, and D in all months of 2017 coverage.
- For FFS patients, no months of enrollment in Medicare's End State Renal Disease (ESRD) program.

Cancer patients were identified as individuals with cancer ICD-10 codes (provided in Appendix G, Tables G3, G4, G7, G10, and G12) in any position on qualified claims, which are described in the table in Figure 24. Patients were required to have a cancer ICD-10 diagnosis code in any position on one inpatient, one observation, or one emergency department visit, or two or more non-acute inpatient or outpatient evaluation and management services that occurred on different dates of service. Patients identified as more than one of the five blood cancer categories in the year were assigned to the cancer identified on the latest available qualified claim. Qualified claims were identified by the Current Procedural Terminology (CPT), Healthcare Common Procedure Coding System (HCPCS), or Revenue codes shown in Figure 24.

FIGURE 24: QUALIFIED CLAIMS REVIEWED FOR BLOOD CANCER DIAGNOSIS CODES

Claims Type	CPT/HCPCS Code	Revenue Code
Outpatient	99201-99205, 99211-99215, 99241-99245, 99341-99345, 99347-99350, 99381-99387, 99391-99397, 99401-99404, 99411, 99412, 99429, 99455, 99456, G0402, G0438, G0439, G0463, G0466-G0468, T1015	0510-0517, 0519-0523, 0526-0529, 0982, 0983
Non-acute inpatient	99304-99310, 99315, 99316, 99318, 99324-99328, 99334-99337	0118, 0128, 0138, 0148, 0158, 0190-0194, 0199, 0524, 0525, 0550-0552, 0559
Acute inpatient	99221-99223, 99231-99233, 99238, 99239, 99251-99255, 99291, 99468, 99469, 99471, 99472, 99475-99480	010x, 0110-0115, 0117, 0119-0125, 0127, 0129-0135, 0137, 0139-0145, 0147, 0149-0155, 0157, 0159-0160, 0164, 0166-0175, 0179, 0200-0204, 0206-0214, 0219, 0720-0722
Observation	99217-99220, 99224-99226, G0378, G0379	
Emergency department	99281-99285, G0380-G0384	0450-0452, 0456, 0459, 0981

Identification of 2015 incident blood cancer patient population

For this analysis we identified patients with an initial cancer diagnosis in 2015. The date of service for the earliest identifying cancer claim in 2015 was designated as the patient's index date (date of diagnosis). If the identifying cancer claim was a facility claim, we used the admission date, when available, or the claim from date. Otherwise, the line-level date of service was used.

We first identified the prevalent blood cancer population using 2015 claims and ICD-9 and ICD-10 blood cancer diagnosis codes using a process similar but not identical to the 2016 analysis. Patients were required to have a

cancer diagnosis code in any position on one inpatient, one observation, or one emergency department visit in 2015 or two or more non-acute inpatient or outpatient evaluation and management services that occurred within twelve months of each other, where the first of which had to occur in 2015. Patients identified as more than one of the five blood cancer categories in the year were assigned to the cancer identified on the latest available qualified claim in 2015. Qualified claims were identified by the CPT, HCPCS, or Revenue codes as reported in Figure 26 above.

Cancer patients for this analysis were excluded if they met any of the following criteria:

- Not enrolled in a plan with both medical (Parts A and B) and pharmacy (Part D) coverage for 13 continuous months from January 2014 through January 2015.
- The first qualifying claim reported a diagnosis code indicating relapse or remission were excluded from this analysis (only available on leukemia and multiple myeloma codes). Diagnosis codes indicating relapse or remission are flagged in Appendix G.
- The index date claim was not followed by a second identifying qualified claims within 60 days of the index date.

Among those patients who qualified, we reviewed all claims incurred within the 12 months leading up to the index date. If the patient received a radiation oncology service, direct anticancer drug treatment (refer to Appendix G), chemotherapy administration, or if the patient was diagnosed as having cancer of any type (even outside of blood cancer) during that time, the patient was excluded. A patient was determined to have been diagnosed with cancer other than blood cancer if that person reported a cancer ICD-9 or ICD-10 diagnosis code (**Figure 25**) in any position on one inpatient, observation, ER visit, or two or more non-acute inpatient or outpatient evaluation and management claims on different dates of service. A patient was determined to have been diagnosed with blood cancer if that person reported a cancer ICD-9 or ICD-10 diagnosis code in any position on any one qualified claim.

FIGURE 25: ICD-9 AND ICD-10 CANCER DIAGNOSIS CODES USED TO ELIMINATE PATIENTS PREVIOUSLY DIAGNOSED WITH CANCER

ICD-9 Diagnosis Code	Description
140.xx-172.xx	Primary malignant neoplasms, not lymphatic or hematopoietic
174.xx-195.xx	Primary malignant neoplasms, not lymphatic or hematopoietic
196.xx-198.xx	Secondary malignant neoplasms (i.e., metastatic)
199.xx	Malignant neoplasms, unknown site
209.0x-209.3x	Neuroendocrine tumors
230.xx-234.xx	Carcinoma in situ

ICD-10 Diagnosis Code	Description
C000-C439	Primary malignant neoplasms, not lymphatic or hematopoietic
C450-C499, C50011-C768	Primary malignant neoplasms, not lymphatic or hematopoietic
C770-C799, C7B00-C7B09	Secondary malignant neoplasms (i.e., metastatic)
C800-C802	Malignant neoplasms, unknown site
C49A0-C4A9, C7A00-C7A098	Neuroendocrine tumors
D0000-D099	Carcinoma in situ

Patients remained in the study through the earlier of their departure from the data or the end of study period; 2016 for MAPD and 2017 for FFS.

Medicare enrollment type and low income status assignment

MAPD and FFS patients were identified by their Medicare enrollment type (aged or disabled). Because original reason for entering Medicare is not available on the CHSD data, MAPD patients were identified as aged if they were 65 or older at the beginning of 2014. All other MAPD patients were considered disabled. The Medicare enrollment type for FFS patients was assigned based on each patient's original reason for entering Medicare (aged or disabled).

Part D Low Income Subsidy (LIS) patients were identified in each calendar year after diagnosis for both MAPD (2015 and 2016) and FFS (2015, 2016, and 2017) patients. MAPD patients were identified as LIS based on their prescription drug copays in 2016. Patients with copays equal to Part D subsidy copays (\$1.20, \$2.65, \$3.60, \$6.60) were considered LIS. For FFS patients, Part D LIS was assigned based on the Part D LIS eligibility status on the majority of calendar months in 2015. In the event of a tie, Part D LIS eligibility was assigned based on the patient's last month of eligibility in 2015.

For the FFS patient population, dual eligibility was determined in the index year (2015). Patients who were dual eligible for the majority of calendar months in 2015 were identified as Medicare dual eligible patients throughout the study. Patients with an equal number of non-dual months as dual months in 2015 were assigned based on their dual status in their last month of eligibility in 2015. Dual status was not available for MAPD patients.

Service category assignment

We assigned claims to the various service categories following the below hierarchy. Detailed descriptions of the types of services included in each category are summarized in Appendix A and supporting code lists are identified in Appendix H when referenced.

1. *Transplant*. Includes all services incurred within 30 days of a transplant procedure (to include patient conditioning), services incurred during the inpatient or outpatient procedure, and services incurred in the 100 days after discharge of inpatient procedure or through date of outpatient procedure.^{xiii, xiv} (See Appendix H, Tables H15, H16, H17, and H18.)
2. *Anticancer drug therapy*. Includes all claims lines associated with anticancer drug treatments (chemotherapy, immunotherapy, and other biologic agents) and supportive care including:
 - a. Physician- and prescription-administered chemotherapy, immunotherapy, and biologic agents. (See Appendix H, Tables H1 and H3.)
 - b. Inpatient admissions for chemotherapy Medicare Severity Diagnosis-Related Groups (MS-DRGs). (See Appendix H, Table H2.)
 - c. Drug administration. (See Appendix H, Table H4.)
 - d. Adjuvant therapy. (See Appendix H, Tables H6 and H7.)
 - i. Blood transfusions are included in this category (See Appendix H, Tables H19 and H20).
 - e. Hematopoietic agents. (See Appendix H, Tables H8 and H9.)
 - f. Antiemetics:^{xv}
 - For office-administered antiemetics (see Appendix H, Table H10) and antiemetic claims lines when administered within one day of a physician-administered chemotherapy drug (see Appendix H, Table H1) or within 30 days of a fill of a chemotherapy prescription (see Appendix H, Table H3).
 - For pharmacy-administered antiemetics (see Appendix H, Table H11), antiemetic claims lines when prescription is filled from within 14 days before through seven days after a

physician-administered chemotherapy service (see Appendix H, Table H1) or within 30 days of a fill of a chemotherapy prescription (see Appendix H, Table H3).

3. *Radiation oncology*. Includes claims reporting at least one radiation oncology treatment. (See Appendix H, Tables H12, H13, and H14.)
4. *Inpatient hospital*. Includes claims for all remaining acute and non-acute (i.e., skilled nursing facility) inpatient admissions billed by the inpatient facility.
5. *Outpatient hospital*. Includes all remaining claims billed by an outpatient hospital or ambulatory surgical center.
6. *Professional services*. Includes all remaining services billed by professionals, across all sites of care. Professionals to include surgeons, oncologists and other specialists, primary care physicians, nurse practitioners and physician assistants, therapists, and other healthcare providers who bill separately from or independently of facility claims.
7. *Other*. Includes all remaining services incurred in each time period.

Appendix A: Service Category Descriptions

<p>Bone Marrow Transplant</p> <p>All costs incurred within 30 days prior to 100 days following an inpatient or outpatient bone marrow transplant procedure.</p>	<p>Radiation Oncology</p> <p>Outpatient facility and professional claims reporting a Revenue code of 0333 or a radiation oncology procedure code.</p>
<p>Anticancer Drug Therapy (Part B)</p> <ul style="list-style-type: none"> • Physician-administered anticancer target drugs: Chemotherapy, immunotherapy, and biologic agents. • Professional chemotherapy administration. • Inpatient facility admissions for chemotherapy. • Hematopoietic agents. • Chemotherapy adjuncts. • Antiemetics. • Adjuvant therapy including blood transfusions. <p>Anticancer Drug Therapy (Part D)</p> <ul style="list-style-type: none"> • Prescription-administered anticancer target drugs: Chemotherapy, immunotherapy, and biologic agents. 	<p>Inpatient Facility</p> <ul style="list-style-type: none"> • Acute inpatient admissions excluding those billed under chemotherapy MS-DRGs. <ul style="list-style-type: none"> ○ Medical admissions ○ Surgical (cancer and non-cancer-related) admissions ○ Radiation oncology services if administered as part of an inpatient stay ○ Anticancer drug therapy services if administered as part of an inpatient stay not billed under a chemotherapy MS-DRG • Non-acute inpatient admissions <ul style="list-style-type: none"> ○ Inpatient rehabilitation facility (IRF), long-term acute care facility (LTAC), and skilled nursing facility (SNF) stays ○ Radiation oncology services if administered as part of an inpatient stay ○ Anticancer drug therapy services if administered as part of an inpatient stay not billed under a chemotherapy MS-DRG
<p>Outpatient Facility</p> <p>All non-chemotherapy and non-radiation oncology services billed by a hospital outpatient facility or ambulatory surgical center.</p> <ul style="list-style-type: none"> • Outpatient surgery (cancer and non-cancer-related) • Emergency room visits not resulting in an inpatient admission • Radiology (excluding radiation oncology), laboratory, and pathology services • All other facility fees (operating room [OR], nursing, anesthesia, durable medical equipment, prosthetics, orthotics, and supplies [DMEPOS], etc.) 	<p>Professional Services</p> <p>All non-chemotherapy and radiation oncology-related services billed by medical professionals</p> <ul style="list-style-type: none"> • Inpatient professional services • Emergency room professional services • Surgical and anesthesia professional services • Observation, urgent care, and office visits • Professional charges related to radiology (excluding radiation oncology), laboratory, and pathology services
<p>Other Services</p> <ul style="list-style-type: none"> • Home Health • Transportation • Other Drugs and Administration • Hospice • Vision • DMEPOS 	

Appendix B: Monthly Allowed Spending by Blood Cancer

FIGURE B1: MAPD ALLOWED SPENDING PER ACUTE LEUKEMIA PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2016)

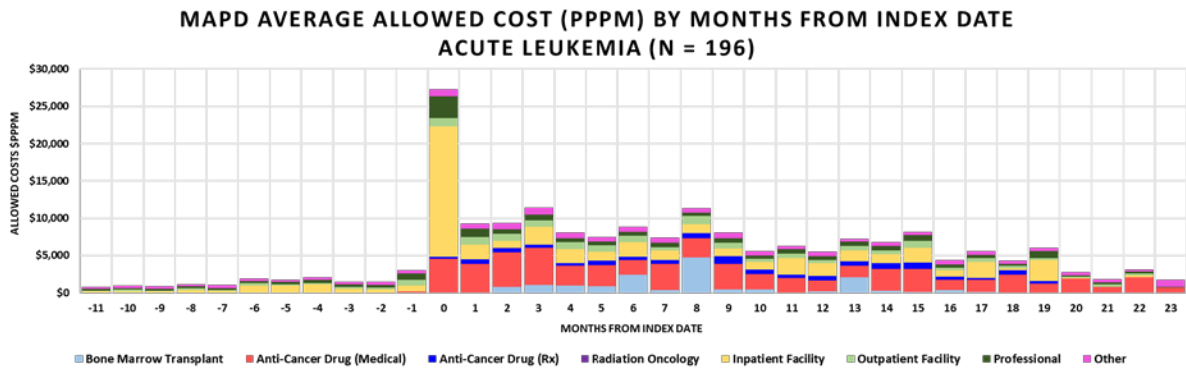


FIGURE B2: MAPD ALLOWED SPENDING PER CHRONIC LEUKEMIA PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2016)

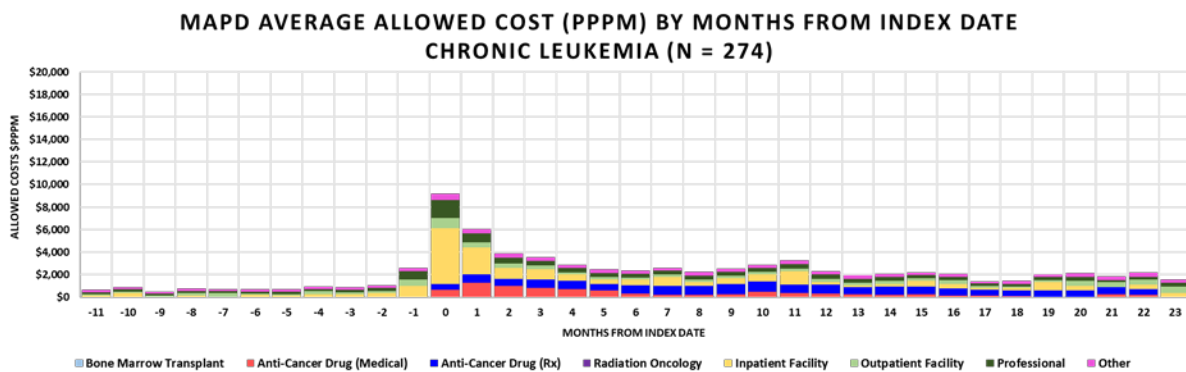


FIGURE B3: MAPD ALLOWED SPENDING PER BONE MARROW DISORDER PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2016)

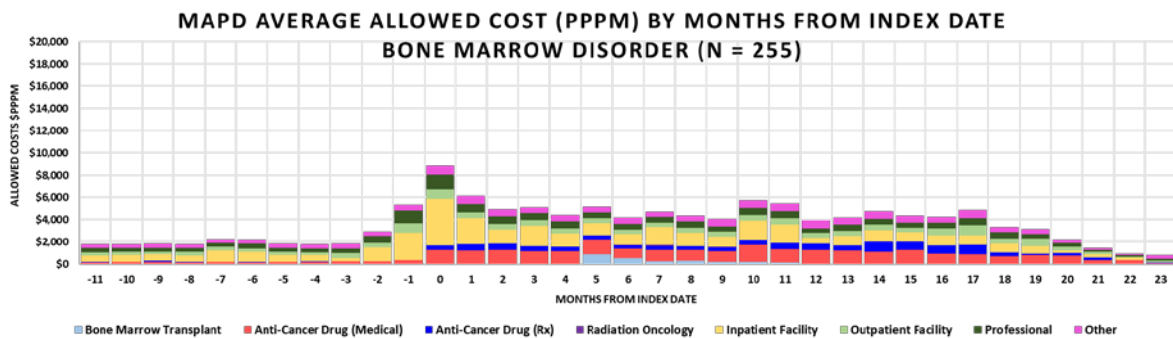


FIGURE B4: MAPD ALLOWED SPENDING PER LYMPHOMA PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2016)

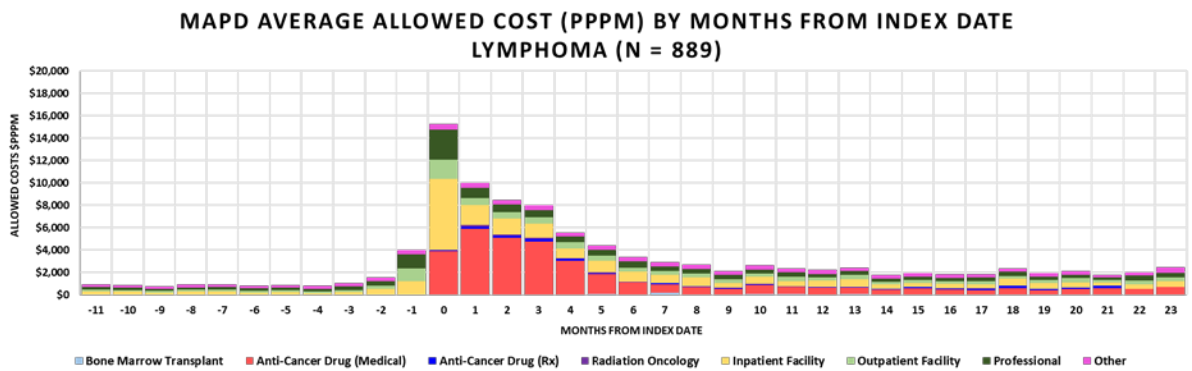


FIGURE B5: MAPD ALLOWED SPENDING PER MULTIPLE MYELOMA PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2016)

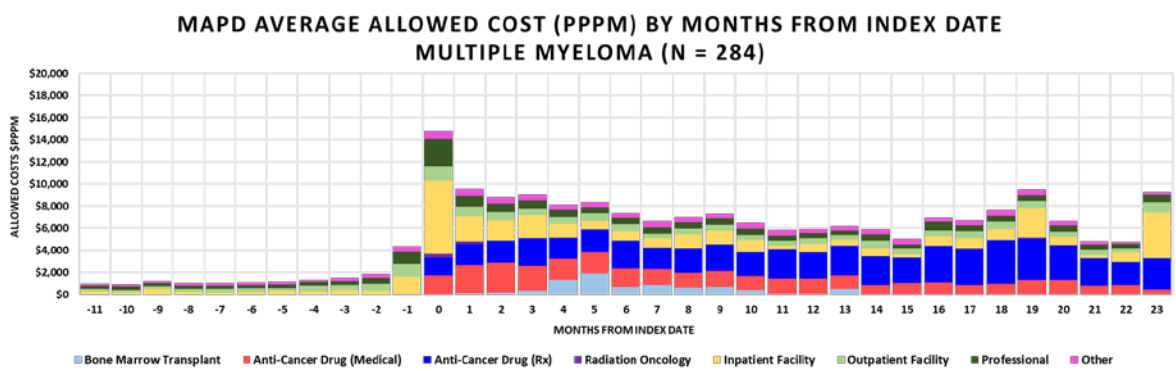


FIGURE B6: FFS ALLOWED SPENDING PER ACUTE LEUKEMIA PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2017)

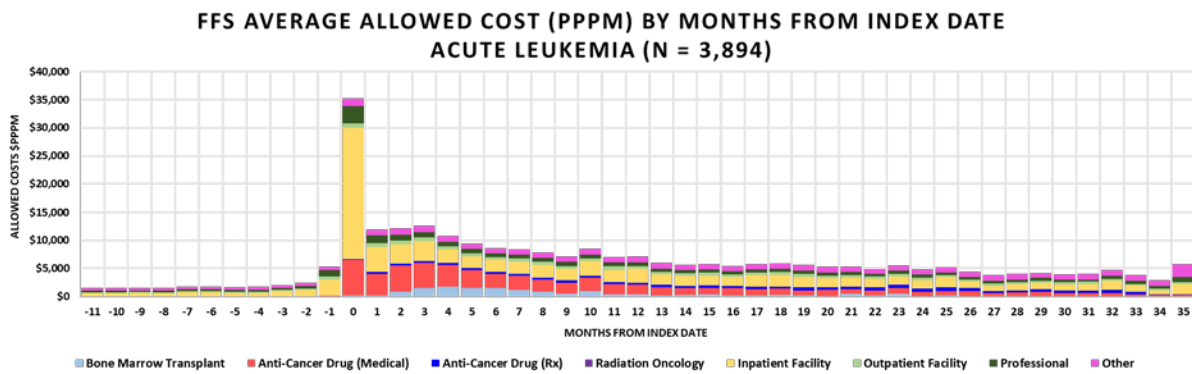


FIGURE B7: FFS ALLOWED SPENDING PER CHRONIC LEUKEMIA PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2017)

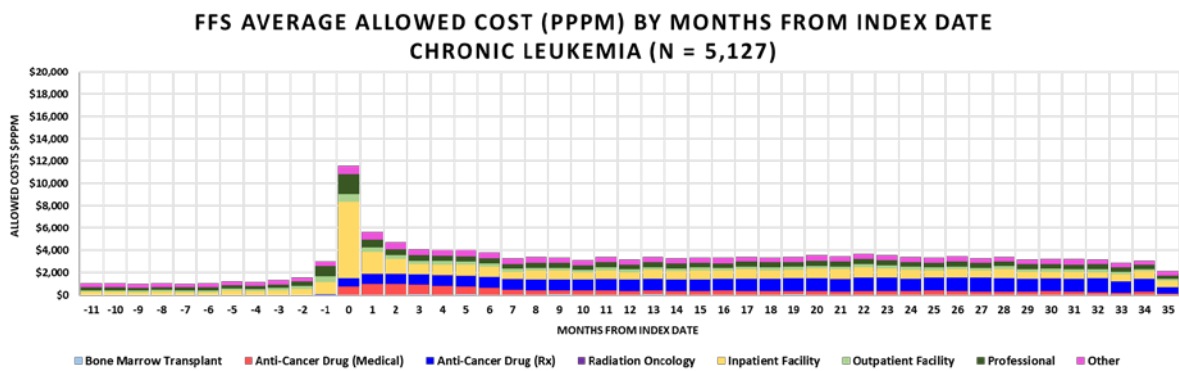


FIGURE B8: FFS ALLOWED SPENDING PER BONE MARROW DISORDER PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2017)

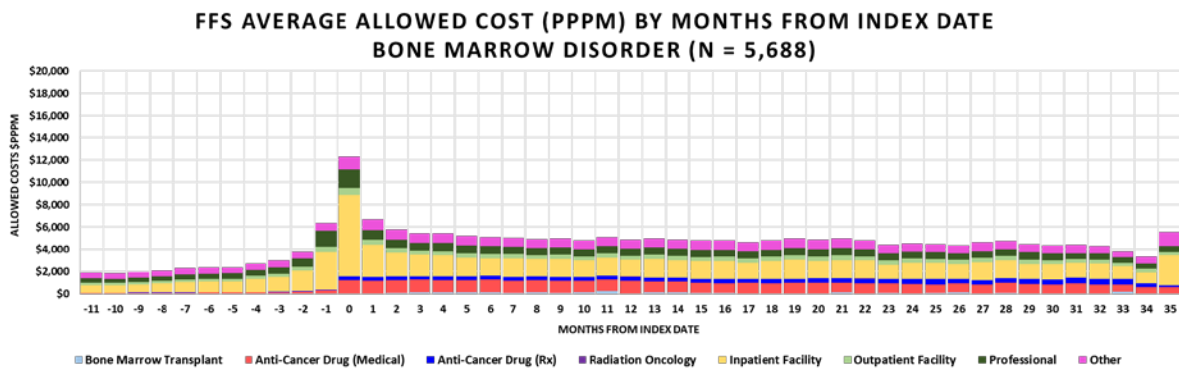


FIGURE B9: FFS ALLOWED SPENDING PER LYMPHOMA PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2017)

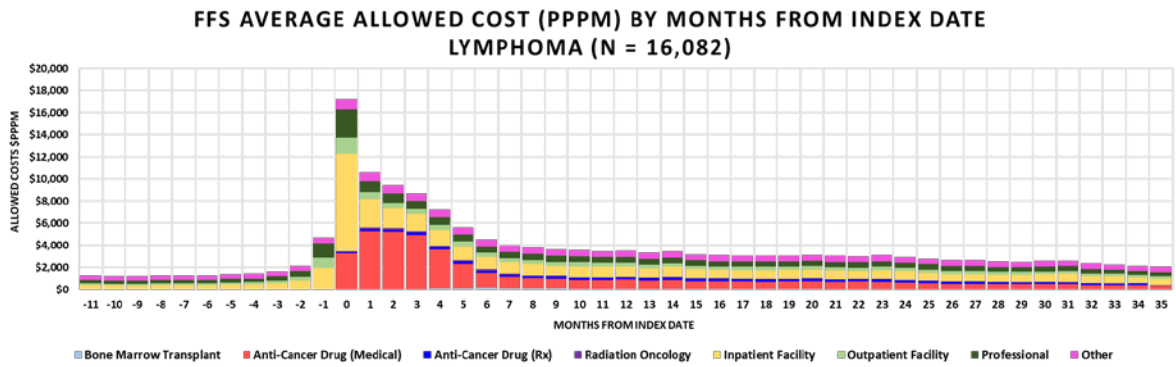
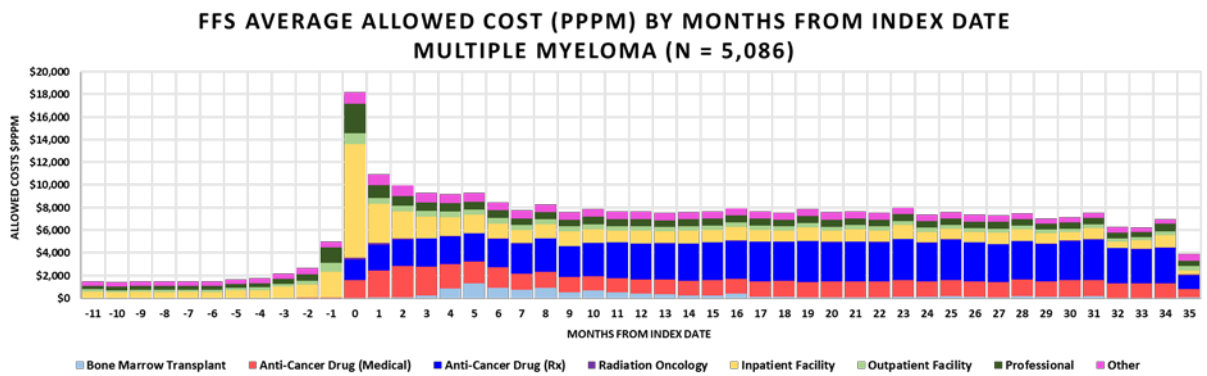


FIGURE B10: FFS ALLOWED SPENDING PER MULTIPLE MYELOMA PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2017)



Appendix C: Monthly Patient Out-of-Pocket Costs by Blood Cancer

FIGURE C1: MAPD PATIENT OUT-OF-POCKET SPENDING PER ACUTE LEUKEMIA PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2016)

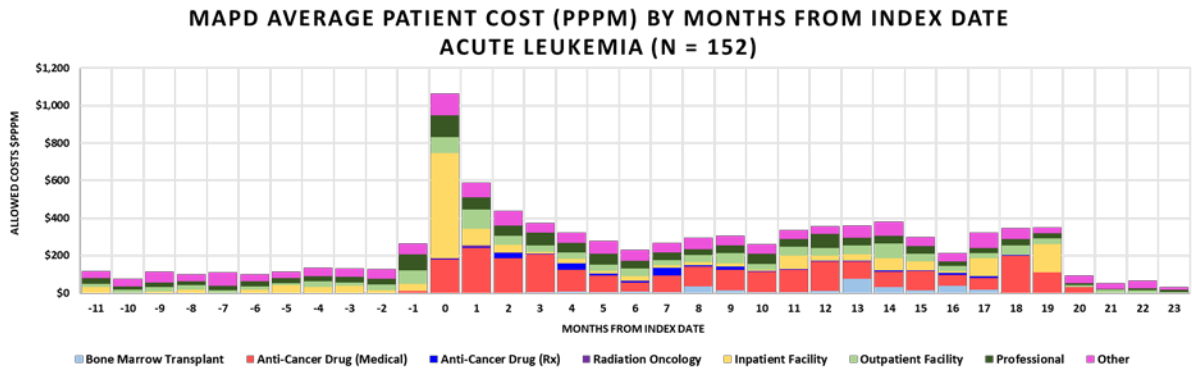


FIGURE C2: MAPD PATIENT OUT-OF-POCKET SPENDING PER CHRONIC LEUKEMIA PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2016)

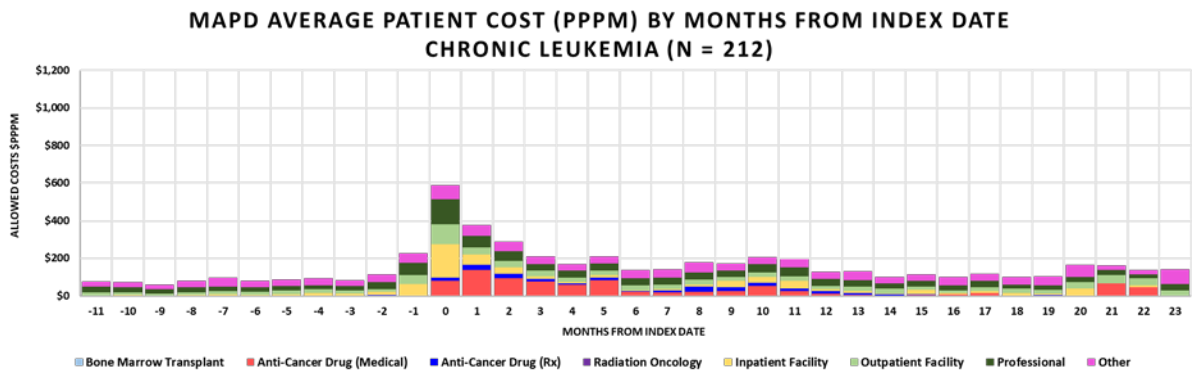


FIGURE C3: MAPD PATIENT OUT-OF-POCKET SPENDING PER BONE MARROW DISORDER PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2016)

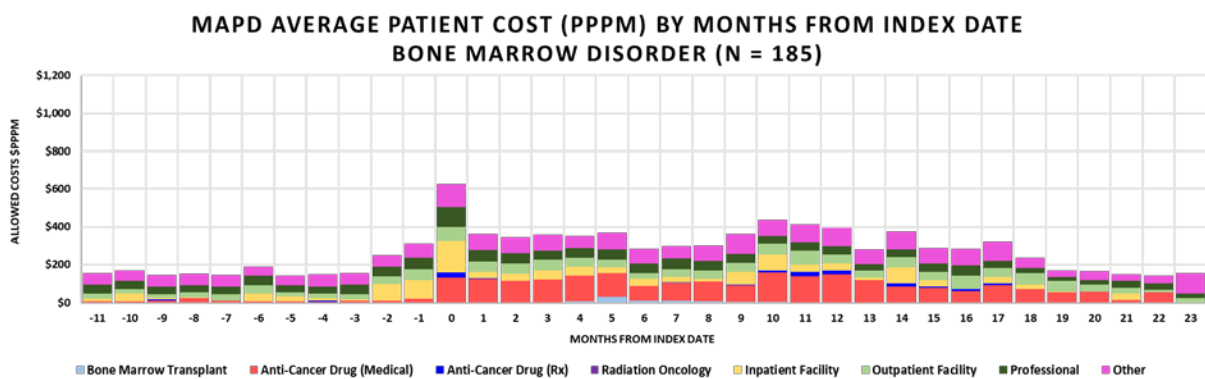


FIGURE C4: MAPD PATIENT OUT-OF-POCKET SPENDING PER LYMPHOMA PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2016)

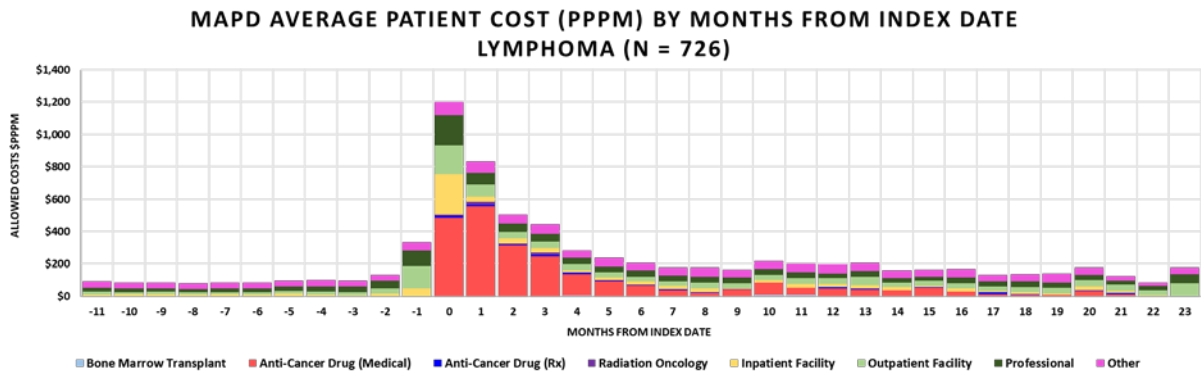


FIGURE C5: MAPD PATIENT OUT-OF-POCKET SPENDING PER MULTIPLE MYELOMA PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2016)

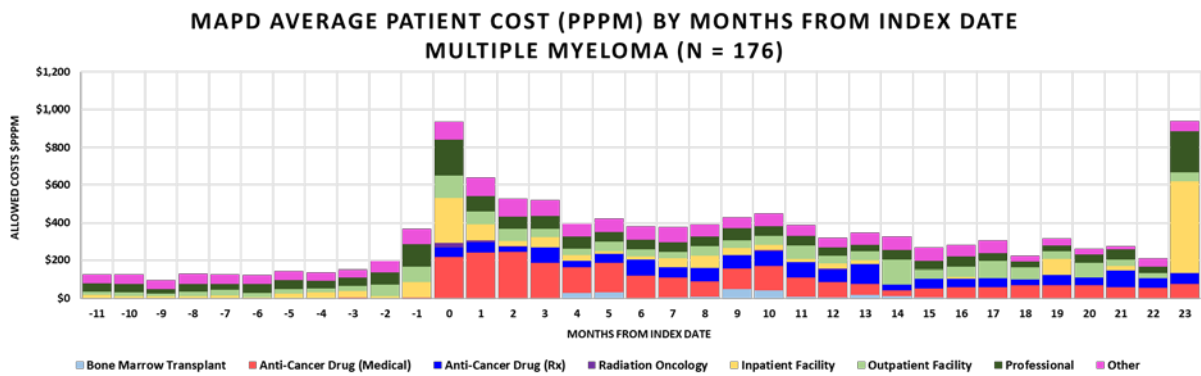


FIGURE C6: FFS PATIENT OUT-OF-POCKET SPENDING PER ACUTE LEUKEMIA PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2017)

FIG F4. FFS AVERAGE PATIENT COST (PPPM) BY MONTHS FROM INDEX DATE
ACUTE LEUKEMIA (N = 2,919)

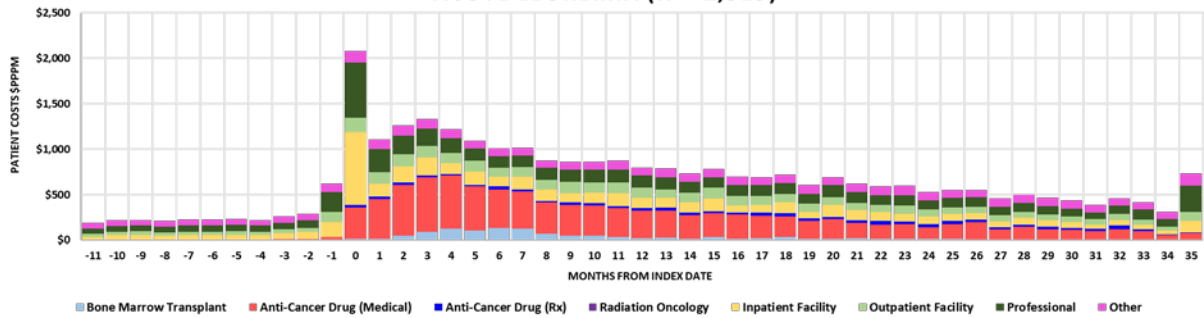


FIGURE C7: FFS PATIENT OUT-OF-POCKET SPENDING PER CHRONIC LEUKEMIA PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2017)

FIG F5. FFS AVERAGE PATIENT COST (PPPM) BY MONTHS FROM INDEX DATE
CHRONIC LEUKEMIA (N = 4,240)

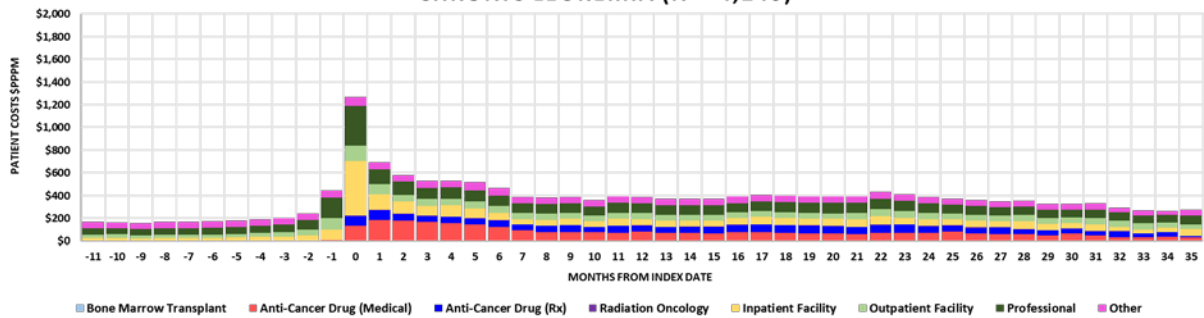


FIGURE C8: FFS PATIENT OUT-OF-POCKET SPENDING PER BONE MARROW DISORDER PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2017)

FFS AVERAGE PATIENT COST (PPPM) BY MONTHS FROM INDEX DATE
BONE MARROW DISORDER (N = 4,443)

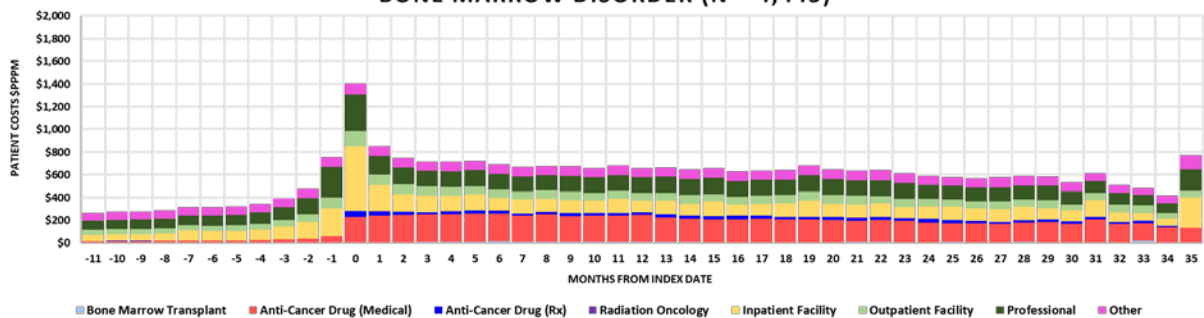


FIGURE C9: FFS PATIENT OUT-OF-POCKET SPENDING PER LYMPHOMA PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2017)

FIG F7. FFS AVERAGE PATIENT COST (PPPM) BY MONTHS FROM INDEX DATE
LYMPHOMA (N = 12,868)

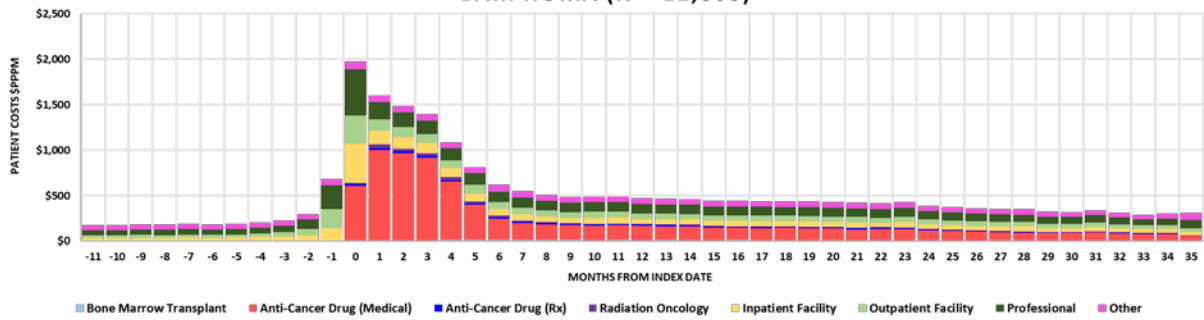
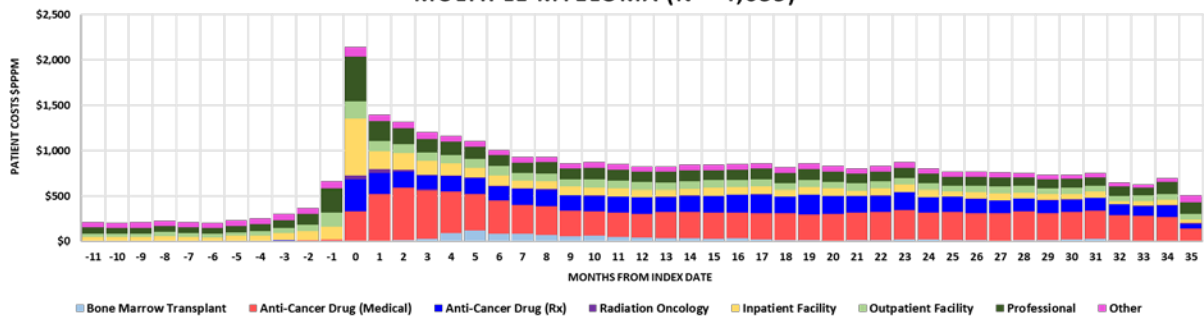


FIGURE C10: FFS PATIENT OUT-OF-POCKET SPENDING PER MULTIPLE MYELOMA PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2017)

FFS AVERAGE PATIENT COST (PPPM) BY MONTHS FROM INDEX DATE
MULTIPLE MYELOMA (N = 4,035)



Appendix D: Annual Allowed Cost Deciles for Actively Treated Patients

FIGURE D1: MAPD AND FFS CUMULATIVE ALLOWED SPENDING DECILES –TREATED POPULATION

Cancer Type	Decile								
	10th	20th	30th	40th	50th	60th	70th	80th	90th
MAPD:									
Acute Leukemia	\$30,819	\$49,943	\$72,055	\$105,307	\$135,607	\$164,016	\$200,027	\$259,549	\$356,272
Chronic Leukemia	\$28,137	\$39,022	\$46,781	\$61,876	\$81,680	\$102,062	\$126,590	\$152,469	\$201,183
Bone Marrow Disorder	\$26,022	\$38,311	\$51,616	\$62,371	\$86,002	\$127,411	\$149,768	\$193,446	\$249,610
Lymphoma	\$25,446	\$41,991	\$57,798	\$73,304	\$86,234	\$102,316	\$113,014	\$140,653	\$174,560
Multiple Myeloma	\$27,824	\$50,795	\$74,213	\$98,585	\$138,539	\$167,047	\$215,406	\$257,344	\$317,950
FFS:									
Acute Leukemia	\$44,817	\$74,144	\$102,052	\$129,914	\$160,752	\$200,261	\$246,179	\$314,747	\$422,432
Chronic Leukemia	\$44,034	\$67,005	\$90,423	\$117,411	\$145,429	\$181,039	\$218,957	\$257,115	\$298,582
Bone Marrow Disorder	\$40,180	\$61,514	\$80,967	\$106,958	\$130,933	\$155,861	\$188,640	\$234,919	\$308,591
Lymphoma	\$45,003	\$68,176	\$86,620	\$102,500	\$119,274	\$139,069	\$163,233	\$195,750	\$254,410
Multiple Myeloma	\$57,104	\$96,667	\$132,832	\$167,995	\$208,476	\$256,856	\$304,363	\$349,152	\$409,667

FIGURE D2: MAPD AND FFS CUMULATIVE ALLOWED SPENDING DECILES –TREATED POPULATION BY SERVICE CATEGORY

Cancer Type (Service Category)	Decile								
	10th	20th	30th	40th	50th	60th	70th	80th	90th
MAPD (Chemo, Rad Onc, Trans):									
Acute Leukemia	\$2,342	\$8,943	\$17,717	\$35,054	\$45,917	\$73,855	\$91,033	\$125,069	\$199,628
Chronic Leukemia	\$1,227	\$5,694	\$14,770	\$29,831	\$42,849	\$55,936	\$79,577	\$99,463	\$145,934
Bone Marrow Disorder	\$804	\$8,805	\$15,210	\$22,645	\$37,246	\$48,252	\$56,808	\$81,583	\$208,813
Lymphoma	\$3,936	\$10,542	\$19,725	\$27,454	\$33,718	\$40,849	\$49,195	\$64,186	\$93,667
Multiple Myeloma	\$5,122	\$12,115	\$26,689	\$42,268	\$73,433	\$106,154	\$134,657	\$174,447	\$241,470
MAPD (All Other):									
Acute Leukemia	\$17,355	\$31,233	\$41,031	\$51,157	\$67,238	\$89,349	\$118,112	\$131,568	\$165,365
Chronic Leukemia	\$9,352	\$12,333	\$16,505	\$19,620	\$27,204	\$32,661	\$41,052	\$65,479	\$87,554
Bone Marrow Disorder	\$10,981	\$14,729	\$17,493	\$32,114	\$43,448	\$64,804	\$78,120	\$89,568	\$122,552
Lymphoma	\$10,620	\$18,949	\$28,542	\$37,166	\$44,129	\$51,454	\$62,433	\$77,596	\$108,244
Multiple Myeloma	\$11,101	\$17,910	\$22,846	\$32,698	\$43,867	\$52,738	\$64,750	\$90,156	\$140,275
FFS (Chemo, Rad Onc, Trans):									
Acute Leukemia	\$1,530	\$6,928	\$14,715	\$27,204	\$42,607	\$61,476	\$85,668	\$124,117	\$205,414
Chronic Leukemia	\$3,552	\$17,268	\$31,634	\$49,723	\$72,762	\$100,162	\$142,227	\$202,510	\$240,816
Bone Marrow Disorder	\$775	\$6,637	\$13,322	\$22,583	\$33,312	\$45,929	\$64,737	\$91,327	\$145,298
Lymphoma	\$5,637	\$14,666	\$26,255	\$34,872	\$42,531	\$50,837	\$69,148	\$93,225	\$130,409
Multiple Myeloma	\$10,263	\$25,578	\$49,638	\$81,820	\$116,756	\$157,093	\$213,326	\$267,116	\$320,470
FFS (All Other):									
Acute Leukemia	\$31,555	\$49,691	\$66,475	\$81,969	\$102,235	\$125,015	\$152,745	\$186,972	\$263,520
Chronic Leukemia	\$13,659	\$19,963	\$27,584	\$34,720	\$44,506	\$57,611	\$72,556	\$94,172	\$136,723
Bone Marrow Disorder	\$21,022	\$36,482	\$47,413	\$59,781	\$72,811	\$91,794	\$116,109	\$151,139	\$195,667
Lymphoma	\$20,586	\$32,534	\$43,371	\$53,190	\$63,840	\$76,562	\$93,151	\$115,959	\$158,509
Multiple Myeloma	\$20,665	\$30,566	\$41,103	\$50,126	\$62,236	\$75,394	\$93,162	\$121,978	\$163,604

FIGURE D3: PER PATIENT PER YEAR (PPY) ANTICANCER DRUG THERAPY ALLOWED SPENDING DECILES (FIRST 12 MONTHS AFTER DIAGNOSIS) – BY CANCER TYPE

Cancer Type (Service Category)	Decile								
	10th	20th	30th	40th	50th	60th	70th	80th	90th
MAPD (Part B):									
Acute Leukemia	\$4,024	\$9,911	\$20,173	\$36,119	\$48,004	\$55,793	\$75,511	\$105,071	\$122,307
Chronic Leukemia	\$0	\$0	\$0	\$440	\$3,633	\$13,621	\$28,823	\$47,918	\$65,783
Bone Marrow Disorder	\$0	\$1,322	\$3,166	\$20,037	\$21,799	\$26,955	\$48,723	\$58,641	\$83,870
Lymphoma	\$7,064	\$19,415	\$27,110	\$35,775	\$45,547	\$56,765	\$64,014	\$76,570	\$96,741
Multiple Myeloma	\$0	\$3,064	\$6,800	\$16,760	\$25,696	\$33,242	\$42,206	\$56,382	\$73,445
MAPD (Part D):									
Acute Leukemia	\$0	\$0	\$0	\$6	\$13	\$27	\$66	\$143	\$20,373
Chronic Leukemia	\$0	\$11	\$41	\$315	\$2,256	\$10,045	\$32,999	\$73,245	\$113,625
Bone Marrow Disorder	\$0	\$8	\$17	\$50	\$92	\$192	\$2,749	\$14,376	\$67,987
Lymphoma	\$0	\$2	\$10	\$17	\$26	\$41	\$68	\$122	\$366
Multiple Myeloma	\$21	\$83	\$286	\$3,761	\$9,869	\$26,775	\$49,123	\$80,690	\$115,900
FFS (Part B):									
Acute Leukemia	\$6,269	\$13,342	\$25,169	\$37,946	\$49,648	\$61,698	\$77,490	\$101,795	\$142,570
Chronic Leukemia	\$0	\$0	\$0	\$249	\$3,172	\$15,603	\$32,769	\$49,034	\$80,321
Bone Marrow Disorder	\$1,491	\$6,802	\$11,667	\$20,349	\$31,410	\$41,532	\$53,434	\$66,219	\$84,669
Lymphoma	\$12,369	\$24,235	\$34,647	\$45,794	\$55,990	\$63,592	\$70,528	\$85,025	\$107,952
Multiple Myeloma	\$275	\$4,575	\$13,179	\$22,108	\$29,069	\$36,034	\$45,055	\$56,416	\$73,232
FFS (Part D):									
Acute Leukemia	\$0	\$0	\$6	\$15	\$27	\$45	\$83	\$227	\$12,928
Chronic Leukemia	\$5	\$20	\$68	\$378	\$6,333	\$40,586	\$76,775	\$106,565	\$121,539
Bone Marrow Disorder	\$0	\$7	\$17	\$31	\$55	\$101	\$401	\$21,252	\$63,397
Lymphoma	\$0	\$4	\$11	\$18	\$28	\$42	\$67	\$129	\$2,661
Multiple Myeloma	\$21	\$64	\$216	\$10,867	\$29,821	\$49,521	\$69,795	\$95,361	\$123,644

FIGURE D4: PER PATIENT PER YEAR (PPY) ANTICANCER DRUG THERAPY ALLOWED SPENDING DECILES (SECOND 12 MONTHS AFTER DIAGNOSIS) – BY CANCER TYPE

Cancer Type (Service Category)	Decile								
	10th	20th	30th	40th	50th	60th	70th	80th	90th
MAPD (Part B):									
Acute Leukemia	\$0	\$0	\$0	\$59	\$1,705	\$9,793	\$15,262	\$29,293	\$80,174
Chronic Leukemia	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$579
Bone Marrow Disorder	\$0	\$0	\$0	\$0	\$0	\$4,461	\$8,558	\$31,877	\$39,379
Lymphoma	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$4,876	\$14,849
Multiple Myeloma	\$0	\$0	\$0	\$0	\$0	\$1	\$6,722	\$15,115	\$39,233
MAPD (Part D):									
Acute Leukemia	\$0	\$0	\$0	\$0	\$0	\$0	\$9	\$30	\$25,111
Chronic Leukemia	\$0	\$0	\$0	\$0	\$190	\$9,684	\$18,961	\$31,347	\$67,797
Bone Marrow Disorder	\$0	\$0	\$0	\$5	\$21	\$36	\$207	\$12,077	\$63,530
Lymphoma	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$21
Multiple Myeloma	\$0	\$0	\$0	\$17	\$120	\$6,705	\$34,460	\$69,158	\$85,590
FFS (Part B):									
Acute Leukemia	\$0	\$0	\$0	\$1,220	\$5,970	\$16,858	\$30,465	\$43,886	\$67,610
Chronic Leukemia	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1,216	\$26,867
Bone Marrow Disorder	\$0	\$0	\$1,204	\$4,583	\$11,853	\$21,313	\$36,254	\$46,934	\$70,146
Lymphoma	\$0	\$0	\$0	\$0	\$0	\$0	\$3,501	\$27,134	\$42,104
Multiple Myeloma	\$0	\$0	\$0	\$0	\$1,529	\$9,754	\$25,667	\$42,367	\$72,485
FFS (Part D):									
Acute Leukemia	\$0	\$0	\$0	\$0	\$0	\$5	\$31	\$190	\$15,659
Chronic Leukemia	\$0	\$0	\$0	\$18	\$480	\$37,851	\$78,357	\$105,661	\$131,533
Bone Marrow Disorder	\$0	\$0	\$0	\$0	\$0	\$20	\$63	\$341	\$51,173
Lymphoma	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$7	\$96
Multiple Myeloma	\$0	\$0	\$12	\$109	\$22,714	\$58,760	\$99,819	\$137,585	\$157,039

Appendix E: Annual Patient OOP Spending Deciles for Actively Treated Patients

FIGURE E1: MAPD AND FFS CUMULATIVE PATIENT OOP SPENDING DECILES –TREATED POPULATION

Cancer Type	Decile								
	10th	20th	30th	40th	50th	60th	70th	80th	90th
MAPD:									
Acute Leukemia	\$1,831	\$2,411	\$3,603	\$4,123	\$5,409	\$6,897	\$8,403	\$10,218	\$12,867
Chronic Leukemia	\$840	\$1,905	\$3,093	\$3,494	\$4,916	\$5,208	\$6,800	\$9,340	\$12,733
Bone Marrow Disorder	\$658	\$699	\$1,346	\$3,060	\$3,603	\$7,160	\$8,227	\$11,968	\$21,304
Lymphoma	\$1,366	\$2,318	\$3,679	\$4,479	\$5,565	\$6,768	\$7,614	\$9,085	\$12,266
Multiple Myeloma	\$2,398	\$3,050	\$3,953	\$4,341	\$5,615	\$7,220	\$10,138	\$13,491	\$16,530
FFS:									
Acute Leukemia	\$3,668	\$6,120	\$9,426	\$12,546	\$16,367	\$19,917	\$23,919	\$30,043	\$39,018
Chronic Leukemia	\$4,399	\$7,473	\$11,022	\$13,778	\$17,501	\$20,452	\$22,595	\$25,300	\$29,874
Bone Marrow Disorder	\$4,719	\$7,822	\$10,839	\$14,448	\$18,434	\$22,148	\$26,335	\$30,288	\$40,279
Lymphoma	\$6,439	\$10,212	\$13,326	\$16,168	\$18,579	\$21,390	\$24,422	\$29,029	\$36,075
Multiple Myeloma	\$6,285	\$11,326	\$15,527	\$19,952	\$24,211	\$28,261	\$32,773	\$38,444	\$47,253

FIGURE E2: MAPD AND FFS CUMULATIVE PATIENT OOP SPENDING DECILES –TREATED POPULATION BY SERVICE CATEGORY

Cancer Type (Service Category)	Decile								
	10th	20th	30th	40th	50th	60th	70th	80th	90th
MAPD (Chemo, Rad Onc, Trans):									
Acute Leukemia	\$0	\$193	\$403	\$1,000	\$1,757	\$2,390	\$3,165	\$5,056	\$8,688
Chronic Leukemia	\$4	\$60	\$261	\$829	\$1,216	\$2,549	\$3,769	\$5,718	\$9,175
Bone Marrow Disorder	\$0	\$0	\$218	\$361	\$2,264	\$2,722	\$4,924	\$6,306	\$10,845
Lymphoma	\$0	\$138	\$682	\$1,360	\$2,106	\$3,208	\$3,918	\$5,004	\$7,015
Multiple Myeloma	\$450	\$982	\$1,363	\$1,830	\$2,372	\$3,465	\$5,792	\$8,285	\$12,151
MAPD (All Other):									
Acute Leukemia	\$1,215	\$1,875	\$2,191	\$2,422	\$2,925	\$3,261	\$4,063	\$4,951	\$6,795
Chronic Leukemia	\$700	\$860	\$1,699	\$2,296	\$2,676	\$3,089	\$3,371	\$3,885	\$6,260
Bone Marrow Disorder	\$363	\$687	\$1,156	\$1,346	\$1,925	\$3,176	\$4,478	\$7,424	\$13,189
Lymphoma	\$687	\$1,123	\$1,622	\$2,218	\$2,670	\$3,459	\$4,087	\$5,046	\$7,053
Multiple Myeloma	\$617	\$1,340	\$1,883	\$2,229	\$2,618	\$3,277	\$4,069	\$6,049	\$7,792
FFS (Chemo, Rad Onc, Trans):									
Acute Leukemia	\$24	\$784	\$1,395	\$2,694	\$4,120	\$6,414	\$8,851	\$12,374	\$18,109
Chronic Leukemia	\$93	\$974	\$3,291	\$5,520	\$8,742	\$11,687	\$14,603	\$17,792	\$20,379
Bone Marrow Disorder	\$154	\$996	\$2,383	\$3,706	\$5,660	\$7,720	\$10,595	\$14,280	\$18,877
Lymphoma	\$1,011	\$2,232	\$4,482	\$6,115	\$7,476	\$8,814	\$11,497	\$16,055	\$22,060
Multiple Myeloma	\$1,395	\$3,735	\$6,838	\$9,990	\$13,943	\$19,015	\$22,091	\$26,598	\$33,524
FFS (All Other):									
Acute Leukemia	\$2,786	\$4,338	\$6,277	\$7,893	\$10,058	\$12,091	\$14,599	\$17,673	\$25,368
Chronic Leukemia	\$2,169	\$3,166	\$4,041	\$5,149	\$6,196	\$7,427	\$9,039	\$11,495	\$16,321
Bone Marrow Disorder	\$2,954	\$4,802	\$6,459	\$8,242	\$9,988	\$11,878	\$14,765	\$19,240	\$26,734
Lymphoma	\$3,449	\$5,078	\$6,646	\$8,178	\$9,557	\$11,026	\$12,871	\$15,187	\$19,127
Multiple Myeloma	\$3,039	\$4,317	\$5,503	\$6,639	\$7,839	\$9,192	\$10,722	\$13,220	\$17,965

FIGURE E3: PER PATIENT PER YEAR (PPY) ANTICANCER DRUG THERAPY PATIENT OOP SPENDING DECILES (FIRST 12 MONTHS AFTER DIAGNOSIS) – BY CANCER TYPE

Cancer Type (Service Category)	Decile								
	10th	20th	30th	40th	50th	60th	70th	80th	90th
MAPD (Part B):									
Acute Leukemia	\$15	\$294	\$648	\$1,000	\$1,550	\$2,139	\$3,000	\$4,134	\$7,748
Chronic Leukemia	\$0	\$0	\$0	\$0	\$600	\$1,363	\$2,083	\$4,514	\$8,942
Bone Marrow Disorder	\$0	\$0	\$200	\$650	\$900	\$2,657	\$4,487	\$5,511	\$10,836
Lymphoma	\$0	\$551	\$1,162	\$2,305	\$3,257	\$4,078	\$4,791	\$5,830	\$7,326
Multiple Myeloma	\$0	\$616	\$982	\$1,304	\$1,725	\$2,561	\$4,185	\$5,733	\$8,140
MAPD (Part D):									
Acute Leukemia	\$0	\$0	\$0	\$1	\$3	\$5	\$14	\$34	\$71
Chronic Leukemia	\$0	\$0	\$4	\$6	\$12	\$37	\$83	\$385	\$2,652
Bone Marrow Disorder	\$0	\$0	\$0	\$3	\$8	\$11	\$35	\$54	\$1,906
Lymphoma	\$0	\$0	\$3	\$5	\$9	\$12	\$18	\$29	\$48
Multiple Myeloma	\$0	\$4	\$13	\$22	\$48	\$96	\$241	\$799	\$3,077
FFS (Part B):									
Acute Leukemia	\$434	\$1,306	\$2,148	\$3,578	\$5,069	\$7,092	\$9,434	\$12,325	\$16,399
Chronic Leukemia	\$0	\$0	\$0	\$48	\$691	\$3,373	\$6,829	\$9,886	\$14,899
Bone Marrow Disorder	\$270	\$1,332	\$2,323	\$4,110	\$6,121	\$8,126	\$10,650	\$13,038	\$16,640
Lymphoma	\$1,939	\$4,342	\$6,114	\$8,017	\$10,044	\$11,633	\$12,823	\$14,869	\$19,253
Multiple Myeloma	\$2	\$839	\$2,716	\$4,480	\$5,904	\$7,482	\$9,405	\$11,669	\$15,008
FFS (Part D):									
Acute Leukemia	\$0	\$0	\$1	\$4	\$8	\$14	\$25	\$46	\$162
Chronic Leukemia	\$0	\$5	\$13	\$32	\$103	\$509	\$3,607	\$7,944	\$10,076
Bone Marrow Disorder	\$0	\$1	\$5	\$8	\$15	\$29	\$67	\$1,029	\$4,225
Lymphoma	\$0	\$1	\$3	\$6	\$10	\$16	\$25	\$43	\$136
Multiple Myeloma	\$6	\$20	\$47	\$162	\$1,635	\$3,344	\$5,177	\$7,656	\$9,971

FIGURE E4: PER PATIENT PER YEAR (PPY) ANTICANCER DRUG THERAPY PATIENT OOP SPENDING DECILES (SECOND 12 MONTHS AFTER DIAGNOSIS) – BY CANCER TYPE

Cancer Type (Service Category)	Decile								
	10th	20th	30th	40th	50th	60th	70th	80th	90th
MAPD (Part B):									
Acute Leukemia	\$0	\$0	\$0	\$0	\$0	\$9	\$472	\$1,509	\$3,051
Chronic Leukemia	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$20
Bone Marrow Disorder	\$0	\$0	\$0	\$0	\$0	\$0	\$402	\$2,157	\$4,383
Lymphoma	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$951
Multiple Myeloma	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$318	\$2,273
MAPD (Part D):									
Acute Leukemia	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$6	\$21
Chronic Leukemia	\$0	\$0	\$0	\$0	\$0	\$0	\$12	\$57	\$186
Bone Marrow Disorder	\$0	\$0	\$0	\$0	\$3	\$9	\$10	\$15	\$608
Lymphoma	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$7
Multiple Myeloma	\$0	\$0	\$0	\$0	\$0	\$7	\$77	\$159	\$1,076
FFS (Part B):									
Acute Leukemia	\$0	\$0	\$0	\$266	\$1,115	\$2,975	\$5,190	\$7,556	\$11,790
Chronic Leukemia	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$240	\$5,715
Bone Marrow Disorder	\$0	\$0	\$249	\$1,035	\$2,291	\$3,922	\$7,065	\$9,027	\$12,901
Lymphoma	\$0	\$0	\$0	\$0	\$0	\$0	\$724	\$5,312	\$8,046
Multiple Myeloma	\$0	\$0	\$0	\$0	\$282	\$2,160	\$5,757	\$8,828	\$15,391
FFS (Part D):									
Acute Leukemia	\$0	\$0	\$0	\$0	\$0	\$1	\$12	\$43	\$457
Chronic Leukemia	\$0	\$0	\$0	\$0	\$10	\$123	\$3,507	\$6,983	\$9,071
Bone Marrow Disorder	\$0	\$0	\$0	\$0	\$0	\$5	\$20	\$71	\$2,689
Lymphoma	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$28
Multiple Myeloma	\$0	\$0	\$0	\$19	\$123	\$1,564	\$5,206	\$8,313	\$10,089

Appendix F: Prevalence of Blood Cancers

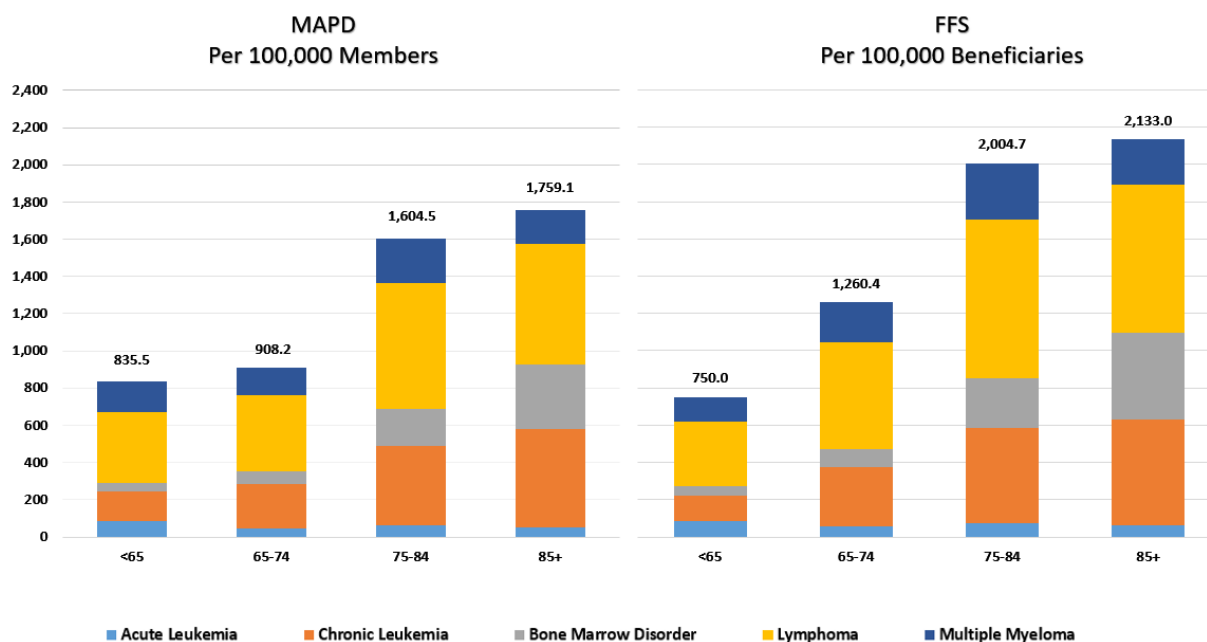
Based on our proprietary MAPD data and the Medicare 100% Part A, B and D data (see data source description), we conducted a snapshot analysis of MAPD and FFS Medicare patients with both new and existing blood cancer diagnoses in 2017 and a longitudinal analysis of MAPD and FFS Medicare patients newly diagnosed with blood cancer in 2015. The blood cancers we examined include acute leukemia, chronic leukemia, lymphoma, multiple myeloma, and bone marrow disorders (see methodology section and Appendix F for blood cancer type identification criteria and identification of newly diagnosed blood cancer patients).

We provide prevalence, incidence and mortality characteristics of these populations as well as cost details including all-cause total healthcare allowed spending (amount paid by payer and patient combined), patient OOP (OOP) spending (coinsurance, deductibles, and copays), and anticancer drug therapy spending.

PREVALENCE, MORTALITY, AND COST OF BLOOD CANCER IN MEDICARE

In 2017, we identified 25,494 MAPD and 325,979 FFS (with Part D) patients who were diagnosed with blood cancer for an overall prevalence of 1,209 per 100,000 MAPD enrollees and 1,476 per 100,000 FFS with Part D beneficiaries. Figure D1 provides prevalence rates by four major age categories: ages under 65 (disabled), 65-74 years old, 75-84 years old, and 85 and older. Prevalence of blood cancer in aggregate across all cancers increases with age but is relatively flat for acute leukemia and increases for multiple myeloma and lymphoma through age 75-84 and thereafter declines. The prevalence of blood cancer in aggregate across all blood cancers among the 85 and older population is more than twice that of those who are less than 65. Lymphoma is the most common of the blood cancers across all age groups.

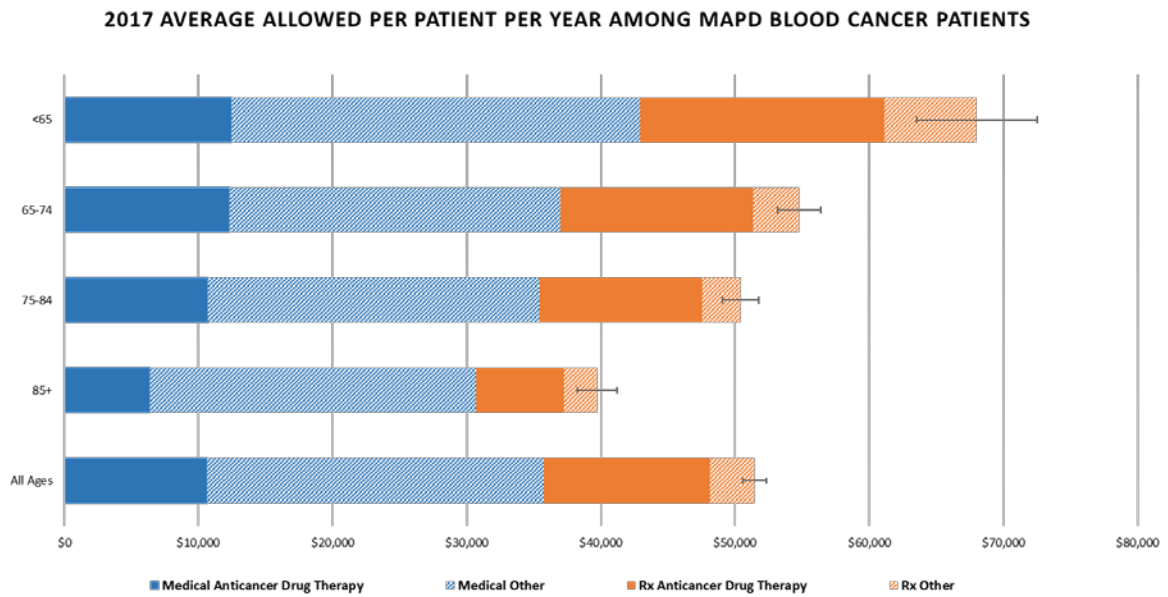
FIGURE F1: 2017 PREVALENCE OF BLOOD CANCER PER 100,000 MEDICARE LIVES



Source: 2017 Milliman Consolidated data set of MAPD enrollees and 2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries

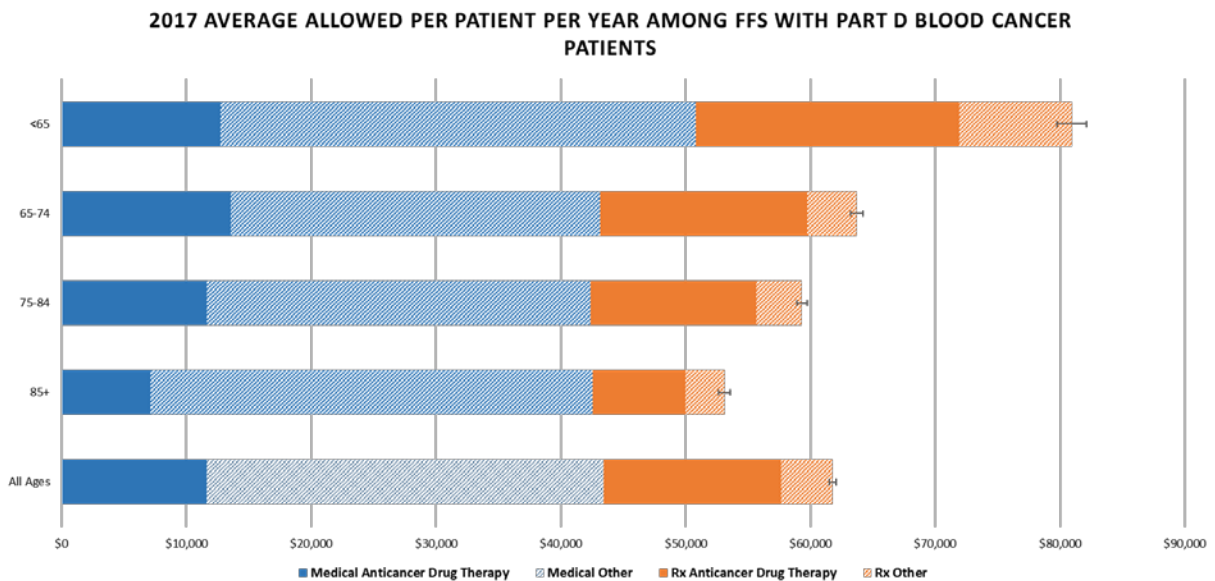
Despite higher prevalence rates of blood cancer among the 85 and older population, costs were lower among this older population compared to all other age cohorts. (Figures F2A and F2B) Anticancer drug therapy contributed less to overall spending for this age group compared to other age groups. The youngest patients reported the highest annual allowed spend with MAPD patients reporting an average of almost \$68,000 PPPY and FFS patients reporting an average of almost \$81,000 PPPY.

FIGURE F2A: 2017 AVERAGE ALLOWED SPENDING PER MAPD BLOOD CANCER PATIENT PER YEAR BY AGE



Source: 2017 Milliman Consolidated data set of MAPD enrollees
 Allowed spending includes the amounts paid for healthcare services by both payer and patient combined.

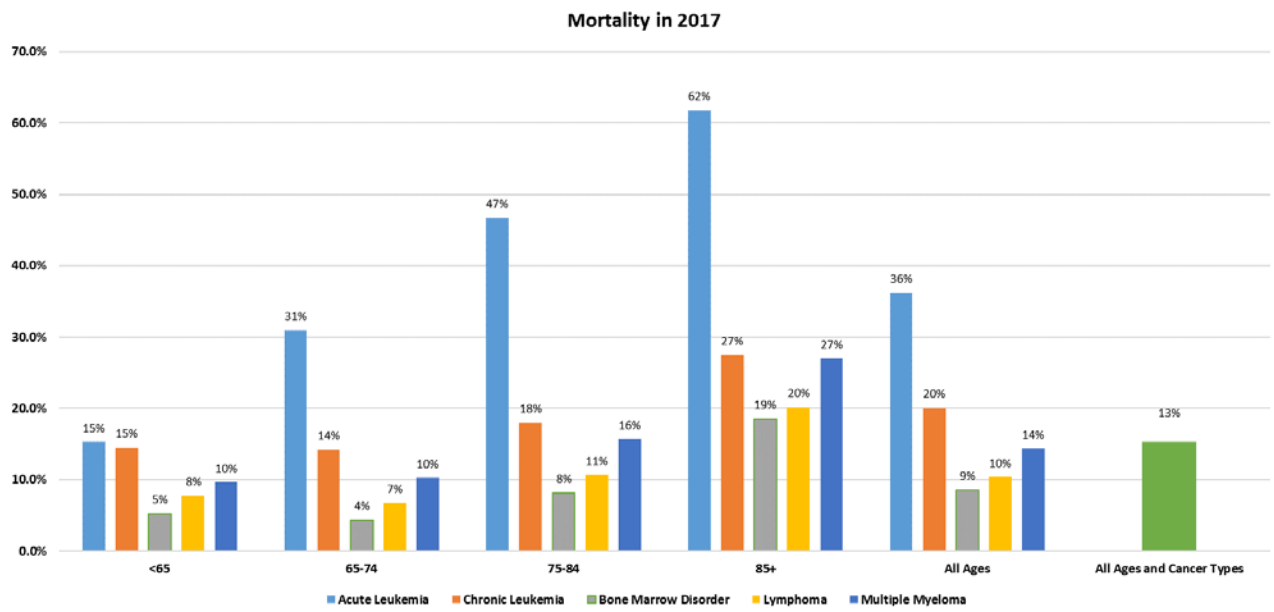
FIGURE F2B: 2017 AVERAGE ALLOWED SPENDING PER FFS WITH PART D BLOOD CANCER PATIENT PER YEAR BY AGE



Source: 2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries
 Allowed spending includes the amounts paid for healthcare services by both payer and patient combined.

We analyzed the annual mortality rates among FFS blood cancer patients. **(Figure F3)** 13.1% of the prevalent 2017 FFS blood cancer patients died in the study year. As expected, mortality increases with age for most blood cancers. Acute leukemia has the highest mortality rate across ages followed by chronic leukemia, multiple myeloma and lymphoma.

FIGURE F3: 2017 FFS BLOOD CANCER MORTALITY BY CANCER TYPE AND AGE



Source: 2017 CMS 100% Medicare Research Identifiable Dataset for FFS beneficiaries

Appendix G: ICD-9 and ICD-10 Blood Cancer Diagnosis Codes

G1: ICD-9 LEUKEMIA DIAGNOSIS CODES

ICD-9								
20400	20401	20402	20410	20411	20412	20500	20501	20502
20510	20511	20512	20530	20531	20532	20600	20601	20602
20700	20701	20702	20720	20721	20722	20800	20801	20802

G2: ICD-9 LEUKEMIA DIAGNOSIS CODES INDICATING RELAPSE OR REMISSION

ICD-9								
20401	20402	20411	20412	20501	20502	20511	20512	20531
20532	20601	20602	20701	20702	20721	20722	20801	20802

G3: ICD-10 ACUTE LEUKEMIA DIAGNOSIS CODES

ICD-10								
C9100	C9101	C9102	C9130	C9131	C9132	C9150	C9151	C9152
C9160	C9161	C9162	C91A0	C91A1	C91A2	C9200	C9201	C9202
C9230	C9231	C9232	C9240	C9241	C9242	C9250	C9251	C9252
C9260	C9261	C9262	C92A0	C92A1	C92A2	C9300	C9301	C9302
C9400	C9401	C9402	C9420	C9421	C9422	C9430	C9431	C9432
C9500	C9501	C9502						

G4: ICD-10 CHRONIC LEUKEMIA DIAGNOSIS CODES

ICD-10					
C9110	C9111	C9112	C9210	C9211	C9212

G5: ICD-9 MULTIPLE MYELOMA DIAGNOSIS CODES

ICD-9						
20300	20301	20302	20310	20311	20312	20381

G6: ICD-9 MULTIPLE MYELOMA DIAGNOSIS CODES INDICATING RELAPSE OR REMISSION

ICD-9				
20301	20302	20311	20312	20381

G7: ICD-10 MULTIPLE MYELOMA DIAGNOSIS CODES

ICD-10								
C9000	C9001	C9002	C9010	C9011	C9012	C9020	C9021	C9022
C9030	C9031	C9032						

G8: ICD-9 LYMPHOMA DIAGNOSIS CODES**ICD-9**

20000	20001	20002	20003	20004	20005	20006	20007	20008
20010	20011	20012	20013	20014	20015	20016	20017	20018
20020	20021	20022	20023	20024	20025	20026	20027	20028
20030	20031	20032	20033	20034	20035	20036	20037	20038
20040	20041	20042	20043	20044	20045	20046	20047	20048
20050	20051	20052	20053	20054	20055	20056	20057	20058
20060	20061	20062	20063	20064	20065	20066	20067	20068
20070	20071	20072	20073	20074	20075	20076	20077	20078
20080	20081	20082	20083	20084	20085	20086	20087	20088
201.xx	20200	20201	20202	20203	20204	20205	20206	20207
20208	20210	20211	20212	20213	20214	20215	20216	20217
20218	20220	20221	20222	20223	20224	20225	20226	20227
20228	20240	20241	20242	20243	20244	20245	20246	20247
20248	20270	20271	20272	20273	20274	20275	20276	20277
20278	20280	20281	20282	20283	20284	20285	20286	20287
20288	20380	20382	2733					

G9: ICD-9 LYMPHOMA DIAGNOSIS CODES INDICATING RELAPSE OR REMISSION**ICD-9**20382

G10: ICD-10 LYMPHOMA DIAGNOSIS CODES

ICD-10								
C8100	C8101	C8102	C8103	C8104	C8105	C8106	C8107	C8108
C8109	C8110	C8111	C8112	C8113	C8114	C8115	C8116	C8117
C8118	C8119	C8120	C8121	C8122	C8123	C8124	C8125	C8126
C8127	C8128	C8129	C8130	C8131	C8132	C8133	C8134	C8135
C8136	C8137	C8138	C8139	C8140	C8141	C8142	C8143	C8144
C8145	C8146	C8147	C8148	C8149	C8170	C8171	C8172	C8173
C8174	C8175	C8176	C8177	C8178	C8179	C8190	C8191	C8192
C8193	C8194	C8195	C8196	C8197	C8198	C8199	C8200	C8201
C8202	C8203	C8204	C8205	C8206	C8207	C8208	C8209	C8210
C8211	C8212	C8213	C8214	C8215	C8216	C8217	C8218	C8219
C8220	C8221	C8222	C8223	C8224	C8225	C8226	C8227	C8228
C8229	C8230	C8231	C8232	C8233	C8234	C8235	C8236	C8237
C8238	C8239	C8240	C8241	C8242	C8243	C8244	C8245	C8246
C8247	C8248	C8249	C8250	C8251	C8252	C8253	C8254	C8255
C8256	C8257	C8258	C8259	C8260	C8261	C8262	C8263	C8264
C8265	C8266	C8267	C8268	C8269	C8280	C8281	C8282	C8283
C8284	C8285	C8286	C8287	C8288	C8289	C8290	C8291	C8292
C8293	C8294	C8295	C8296	C8297	C8298	C8299	C8300	C8301
C8302	C8303	C8304	C8305	C8306	C8307	C8308	C8309	C8310
C8311	C8312	C8313	C8314	C8315	C8316	C8317	C8318	C8319
C8330	C8331	C8332	C8333	C8334	C8335	C8336	C8337	C8338
C8339	C8350	C8351	C8352	C8353	C8354	C8355	C8356	C8357
C8358	C8359	C8370	C8371	C8372	C8373	C8374	C8375	C8376
C8377	C8378	C8379	C8380	C8381	C8382	C8383	C8384	C8385
C8386	C8387	C8388	C8389	C8390	C8391	C8392	C8393	C8394
C8395	C8396	C8397	C8398	C8399	C8400	C8401	C8402	C8403
C8404	C8405	C8406	C8407	C8408	C8409	C8410	C8411	C8412
C8413	C8414	C8415	C8416	C8417	C8418	C8419	C8440	C8441
C8442	C8443	C8444	C8445	C8446	C8447	C8448	C8449	C8460
C8461	C8462	C8463	C8464	C8465	C8466	C8467	C8468	C8469
C8470	C8471	C8472	C8473	C8474	C8475	C8476	C8477	C8478
C8479	C8490	C8491	C8492	C8493	C8494	C8495	C8496	C8497
C8498	C8499	C84A0	C84A1	C84A2	C84A3	C84A4	C84A5	C84A6
C84A7	C84A8	C84A9	C84Z0	C84Z1	C84Z2	C84Z3	C84Z4	C84Z5
C84Z6	C84Z7	C84Z8	C84Z9	C8510	C8511	C8512	C8513	C8514
C8515	C8516	C8517	C8518	C8519	C8520	C8521	C8522	C8523
C8524	C8525	C8526	C8527	C8528	C8529	C8580	C8581	C8582
C8583	C8584	C8585	C8586	C8587	C8588	C8589	C8590	C8591
C8592	C8593	C8594	C8595	C8596	C8597	C8598	C8599	C860
C861	C862	C863	C864	C865	C866	C880	C882	C883
C884	C888	C889	C9140	C9141	C9142			

G11: ICD-9 BONE MARROW DISORDER DIAGNOSIS CODES

ICD-9

23872 23873 23874 23875

G12: ICD-10 BONE MARROW DISORDER DIAGNOSIS CODES

ICD-10

D460 D461 D4620 D4621 D4622 D464 D469 D46A D46B
D46C D46Z

Appendix H: Supporting Code Lists

H1: PHYSICIAN-ADMINISTERED ANTICANCER THERAPY, HCPCS

HCPCS								
A9543	A9545	C9021	C9025	C9027	C9131	C9257	C9259	C9260
C9265	C9273	C9276	C9280	C9284	C9287	C9289	C9292	C9295
C9296	C9297	C9442	C9449	C9453	C9455	C9474	C9475	C9476
C9477	J0202	J0594	J0894	J1930	J1950	J2353	J2860	J3315
J7504	J7511	J9000	J9001	J9002	J9010	J9015	J9017	J9019
J9020	J9025	J9027	J9032	J9033	J9034	J9035	J9039	J9040
J9041	J9042	J9043	J9045	J9047	J9050	J9055	J9060	J9062
J9065	J9070	J9080	J9090	J9091	J9092	J9093	J9094	J9095
J9096	J9097	J9098	J9100	J9110	J9120	J9130	J9140	J9145
J9150	J9151	J9155	J9160	J9165	J9170	J9171	J9176	J9178
J9179	J9181	J9182	J9185	J9190	J9200	J9201	J9205	J9206
J9207	J9208	J9211	J9212	J9213	J9214	J9215	J9216	J9217
J9218	J9228	J9230	J9245	J9250	J9260	J9261	J9262	J9263
J9264	J9265	J9266	J9267	J9268	J9270	J9271	J9280	J9290
J9291	J9293	J9295	J9299	J9300	J9301	J9302	J9303	J9305
J9306	J9307	J9308	J9310	J9315	J9320	J9328	J9330	J9340
J9350	J9351	J9352	J9354	J9355	J9360	J9370	J9371	J9375
J9380	J9390	J9395	J9400	J9999	Q2017	Q2043	Q2048	Q2049
Q2050	Q9979	S0176	J8610	WW044	WW068	S0108	WW045	WW060
WW034	WW054	WW053	WW040	WW041	WW042	WW043	WW046	WW069
WW070	WW071	WW072	WW073	WW074	WW075	WW076	WW077	WW078
WW064	WW052	WW056	WW057	C9016	C9024	C9028	C9030	C9031
C9472	C9480	C9483	C9485	C9491	C9492	J1675	J8510	J8520
J8521	J8530	J8560	J8562	J8565	J8600	J8700	J8705	J8999
J9022	J9023	J9031	J9202	J9203	J9219	J9225	J9285	J9325
J9357	WW002	WW003	WW004	WW005	WW006	WW007	WW008	WW009
WW020	WW030	WW031	WW032	WW080	WW081	WW089	WW090	WW091
WW093	WW094	WW096	WW140					

H2: CHEMOTHERAPY INPATIENT ADMISSION, MS-DRGS

MS DRGs	Description
837	Chemo w acute leukemia as sdx or w high dose chemo agent w MCC
838	Chemo w acute leukemia as sdx w CC or high dose chemo agent
839	Chemo w acute leukemia as sdx w/o CC/MCC
846	Chemotherapy w/o acute leukemia as secondary diagnosis w MCC
847	Chemotherapy w/o acute leukemia as secondary diagnosis w CC
848	Chemotherapy w/o acute leukemia as secondary diagnosis w/o CC/MCC

H3: PRESCRIPTION-ADMINISTERED ANTICANCER THERAPY DRUGS

Generic Drug Names			
Abemaciclib	Abiraterone	Acalabrutinib	Ado-trastuzumab emtansine
Afatinib	Aldesleukin	Alectinib	Alemtuzumab
Altretamine	Anastrozole	Anti-thymocyte globulin, rabbit	Apalutamide
Arsenic trioxide	Asparaginase	Atezolizumab	Avelumab
Axitinib	Azacitidine	Bcg (bacillus calmette-guerin) live vax, intravesical	Bcg live vax, intravesical
Belinostat	Bendamustine	Bendamustine	Bevacizumab
Bexarotene	Bicalutamide	Bicalutamide	Bleomycin
Blinatumomab	Blinatumomab	Bortezomib	Bosutinib
Bosutinib	Brentuximab vedotin	Busulfan	Cabazitaxel
Cabozantinib	Cabozantinib	Capecitabine	Carboplatin
Carfilzomib	Carmustine	Ceritinib	Cetuximab
Chlorambucil	Cisplatin	Cladribine	Clofarabine
Cobimetinib	Copanlisib	Crizotinib	Cyclophosphamide
Cytarabine	Dabrafenib	Dacarbazine	Dactinomycin
Daratumumab	Dasatinib	Daunorubicin	Daunorubicin
Daunorubicin and cytarabine	Daunorubicin, liposomal	Decitabine	Degarelix
Denileukin diftitox	Dinutuximab	Docetaxel	Doxorubicin
Doxorubicin	Doxorubicin, liposomal	Durvalumab	Elotuzumab
Enasidenib	Enzalutamide	Epirubicin	Epirubicin
Equine thymocyte immune globulin	Eribulin	Erlotinib	Estramustine
Etoposide	Everolimus	Exemestane	Floxuridine
Fludarabine	Fluorouracil	Flutamide	Fulvestrant
Gefitinib	Gemcitabine	Gemcitabine	Gemtuzumab ozogamicin
Goserelin	Histrelin	Histrelin	Hydroxyurea cap 500 mg
Ibritumomab tiuxetan	Ibrutinib	Idarubicin	Idelalisib
Ifosfamide	Imatinib	Inotuzumab ozogamicin	Interferon, gamma 1-b
Ipilimumab	Irinotecan	Irinotecan	Ironotecan
Ixabepilone	Ixazomib	Lanreotide	Lapatinib
Lenalidomide	Lenvatinib	Letrozole	Letrozole
Letrozole and ribociclib	Leuprolide	Leuprolide	Leuprolide and norethindrone
Lomustine	Lutetium lu 177 dotatate	Mechlorethamine	Melphalan
Mercaptopurine susp 2000 mg/100ml (20 mg/ml)	Mercaptopurine tab 50 mg	Methotrexate sodium for inj 1 gm	Methotrexate sodium inj 25 mg/ml
Methotrexate sodium inj pf 25 mg/ml	Methotrexate sodium tab 10 mg (base equiv)	Methotrexate sodium tab 15 mg (base equiv)	Methotrexate sodium tab 2.5 mg (base equiv)
Methotrexate sodium tab 5 mg (base equiv)	Methotrexate sodium tab 7.5 mg (base equiv)	Mitomycin	Mitotane
Mitoxantrone	Mitoxantrone	Necitumumab	Nelarabine
Neratinib	Nilotinib	Nilotinib	Nilutamide
Niraparib	Nivolumab	Obinutuzumab	Octreotide
Ofatumumab	Olaparib	Omacetaxine	Omacetaxine mepesuccinate for inj 3.5 mg

Osimertinib	Oxaliplatin	Paclitaxel	Palbociclib
Panitumumab	Panobinostat	Pazopanib	Pazopanib
Pegaspargase	Pembrolizumab	Pemetrexed	Pemetrexed
Pentostatin	Pertuzumab	Pomalidomide	Ponatinib
Ponatinib	Pralatrexate	Procarbazine	Ramucirumab
Regorafenib	Ribociclib	Rituximab	Rituximab and hyaluronidase
Romidepsin	Rucaparib	Ruxolitinib	Ruxolitinib phosphate tab 10 mg (base equivalent)
Ruxolitinib phosphate tab 15 mg (base equivalent)	Ruxolitinib phosphate tab 20 mg (base equivalent)	Ruxolitinib phosphate tab 25 mg (base equivalent)	Ruxolitinib phosphate tab 5 mg (base equivalent)
Siltuximab	Sipuleucel-t	Sonidegib	Sorafenib
Streptozocin	Sunitinib	Talimogene laherparepvec	Tamoxifen
Tamoxifen	Temozolomide	Temsirolimus	Teniposide
Thalidomide	Thioguanine	Thiotepa	Topotecan
Topotecan	Toremifene	Tositumomab	Trabectedin
Trametinib	Trastuzumab	Trifluridine/ tipiracil	Triptorelin
Triptorelin	Valrubicin	Vandetanib	Vemurafenib
Venetoclax	Vinblastine	Vincristine	Vinorelbine
Vismodegib	Vorinostat	Ziv-aflibercept	

H4: ANTICANCER DRUG THERAPY ADMINISTRATION, HCPCS

HCPCS								
61517	96401	96402	96405	96406	96409	96410	96411	96413
96415	96416	96417	96420	96422	96423	96425	96440	96445
96446	96450	96542	96549	G0498				

H5: ANTICANCER DRUG THERAPY ADMINISTRATION, REVENUE CODES

Revenue Codes		
0331	0332	0335

H6: ADJUVANT THERAPY, HCPCS

HCPCS							
J1190	J9209	J2783	J0640	J0207	J2425	J0641	C9293

H7: PRESCRIPTION-ADMINISTERED ADJUVANT THERAPY DRUGS

Generic Drug Names			
Allopurinol	Allopurinol sodium	Aloprim	Amifostine
Calcium folinate	Dexrazoxane	Elitek	Ethyol
Fusilev	Kepivance	Leucovorin calcium	Levoleucovorin
Levoleucovorin calcium	Mesna	Mesnex	Totect
Voraxaze	Zinecard	Zyloprim	

H8: PHYSICIAN-ADMINISTERED HEMATOPOIETIC AGENTS, HCPCS**HCPCS**

J0880	J0881	J0885	J0890	J1440	J1441	J1442	J1446	J2355
J2505	J2796	J2820	J0888	J1447	Q5101	Q9973	Q2047	

H9: PRESCRIPTION-ADMINISTERED HEMATOPOIETIC AGENT DRUGS**Generic Drug Names**

Aranesp	Aranesp albumin free	Aranesp albumin free sureclick	Epogen
Granix	Leukine	Mircera	Neulasta
Neulasta delivery kit	Neumega	Neupogen	Nplate
Omontys	Procrit	Promacta	Zarxio

H10: ANTIEMETICS, HCPCS**HCPCS**

J0780	J1094	J1100	J1200	J1240	J1260	J1453	J1626	J2060
J2250	J2358	J2405	J2469	J2550	J2765	J3230	J3250	J3310
J3410	J8498	J8501	J8540	J8597	J8650	J8655	Q0161	Q0162
Q0163	Q0164	Q0166	Q0167	Q0169	Q0173	Q0174	Q0175	Q0177
Q0180	Q0181	Q9981	S0091	S0119	S0174	S0183	S0166	J2180
J8670	J1630	J1631	J0515					

H11: PRESCRIPTION-ADMINISTERED ANTIEMITIC DRUGS

Generic Drug Names

Active injection kit d	Af-diphedryl	Ahist	Akynzeo
Aler-cap	Aler-dryl	Alertab	Aler-tab
Alka-seltzer plus allergy	Allergy	Allergy childrens	Allergy med
Allergy medication	Allergy medication childr	Allergy rapid melts child	Allergy relief
Allergy relief childrens	Allergy relief nighttime	Allermax	Aloxi
Alprazolam	Alprazolam er	Alprazolam intensol	Alprazolam odt
Alprazolam xr	Altaryl	Ambizine	A-methapred
Anti-hist	Anti-hist allergy	Antivert	Anzemet
Aprepitant	Ativan	Banophen	Baycadron
Benadryl	Benadryl allergy	Benadryl allergy children	Benadryl allergy fastmelt
Benadryl allergy quick di	Benadryl dye-free allergy	Ben-tann	Benztropine mesylate
Bl diphedryl allergy	Bonine	Bonine kids	Cesamet
Childrens allergy	Childrens complete allerg	Chlorpromazine hcl	Cinvanti
Cogentin	Compazine	Complete allergy	Complete allergy medicati
Complete allergy medicine	Complete allergy relief	Compoz	Compro
Cvs allergy	Cvs allergy childrens	Cvs allergy formula	Cvs allergy relief
Cvs allergy relief adult	Cvs allergy relief childr	Cvs allergy relief nightt	Cvs childrens allergy
Cvs dye-free allergy	Cvs motion sickness	Cvs motion sickness ii	Cvs motion sickness relie Cvs sleep aid maximum str
Cvs nighttime sleep aid	Cvs nighttime sleep aid m	Cvs sleep aid	Cvs sleep-aid nighttime
Cvs sleep aid nighttime	Cvs sleep aid nighttime/m	Cvs sleep aid nighttime/r	
Cyclivert	Depo-medrol	Dex combo	Dex la 16 Dexamethasone sodium phos
Dex la 8	Dexamethasone	Dexamethasone intensol	
Dexpak 10 day	Dexpak 13 day	Dexpak 6 day	Dicopanol fusepaq
Dicopanol rapidpaq	Dimenhydrinate	Diphedryl	Diphen
Diphen af	Diphendryl	Diphenhist Diphenhydramine hcl maxim	Diphenhydramine
Diphenhydramine cough	Diphenhydramine hcl		Diphenmax
Dormin	Doubledex	Dramamine	Dramamine for kids
Dramamine less drowsy	Driminate	Dronabinol	Droperidol
Dytan	Dytuss	Eck diph-al	Eck diphedryl
Eck diphedryl allergy	Eck motion sickness	Eck night time sleep-aid	Emend
Eq allergy	Eq allergy relief	Eq allergy relief childre	Eq motion sickness Eq sleep aid maximum stre
Eq motion sickness relief	Eq nighttime sleep aid	Eq nighttime sleep aid ma	
Eq sleep-aid nighttime	Eq allergy	Eq allergy relief	Eq allergy relief childr
Eq childrens allergy	Eq motion sickness relie	Eq nighttime sleep aid	Eq sleep aid maximum str
Eq sleep aid nighttime	Fp complete allergy	Genahist	Geri-dryl
Geri-dryl allergy relief	Gnp allergy	Gnp childrens allergy	Gnp motion sickness relie
Gnp nighttime sleep aid	Gnp sleep time	Goodsense allergy relief	Goodsense sleep aid
Goodsense sleeptime	Granisetron hcl	Granisol	Haldol
Haldol decanoate 100	Haldol decanoate 50	Haloperidol	Haloperidol decanoate
Haloperidol lactate	Hm allergy	Hm allergy childrens	Hm allergy relief
Hm allergy relief childre	Hm allgery multi symptom	Hm motion relief	Hm motion sickness
Hm motion sickness relief	Hm nighttime sleep aid	Hm z-sleep	Hydramine
Hydroxyzine hcl	Hydroxyzine pamoate	Inapsine	KIs allergy medicine

Kp diphenhydramine hcl	Kytril	Locort 11-day	Locort 7-day Lorazepam/sodium chloride
Lorazepam	Lorazepam intensol	Lorazepam/dextrose	
Marezine	Marinol	Mas care-pak	Meclizine 25
Meclizine hcl	Meclizine hydrochloride	Medi-meclizine	Medi-phedryl
Medrol	Medrol dosepak	Meijer antihistamine alle	Methylprednisolone Methylprednisolone sodium
Methylprednisolone acetat	Methylprednisolone dose p	Methylprednisolone pf	
Metoclopramide hcl	Metoclopramide odt	Metozolv odt	Midazolam hcl Midazolam/syrspend sf ph4
Midazolam hcl/nacl	Midazolam hydrochloride	Midazolam hydrochloride/s	
Motion sickness	Motion sickness relief	Motion sickness relief ii	Motion-time
Mp aller med	Mp complete allergy	Mp sleep	Mp sleep formula
Mp travel aid	Multi-symptom allergy	Naramin	Nervine
Night time sleep aid	Nighttime sleep	Nighttime sleep aid	Nighttime sleep-aid
Niravam	Nytol	Nytol maximum strength	Nyt-time sleep caps
Olanzapine	Olanzapine odt	Ondansetron hcl	Ondansetron hcl/dextrose
Ondansetron hydrochloride	Ondansetron odt	Ormir	P-care d40
P-care d80	Pediacare childrens aller	Pediacare childrens night	Perphenazine
Pharbedryl	Phenadoz	Phenergan	Prochlorperazine
Prochlorperazine edisylat	Prochlorperazine maleate	Promethazine hcl	Promethazine hcl plain
Promethazine hydrochlorid	Promethegan	Px allergy Qc sleep aid maximum stre	Qc allergy relief intense
Qc complete allergy medic	Qc rest simply	Ra allergy	Q-dryl
Qlearquil nighttime alle	Quenalin	Ra allergy relief childre	Ra allergy medication
Ra allergy medication chi	Ra allergy relief	Ra motion sickness relief	Ra complete allergy
Ra complete allergy medic	Ra diphedryl allergy	Ra sleep-aid nighttime	Ra nighttime sleep aid Readysharp dexamethasone
Ra sleep aid	Ra sleep aid maximum stre	Rest simply	Restfully sleep
Readysharp methylpredniso	Reglan	Sb allergy medicine	Sb motion sickness
Sancuso	Sb allergy	Scot-tussin allergy relie	Sg diphedryl antihistamin
Sb sleep	Scopolamine	Silphen cough	Simply allergy
Sg diphedryl child	Siladryl allergy	Sleep aid liquid gels max Sleep-aid maximum strengt	Sleep ii
Simply sleep	Sleep aid	Sm allergy relief childre Sm sleep aid maximum stre	Sleeping tablets
Sleep tablets	Sleep tabs		Sm motion sickness
Sleep-tabs	Sm allergy relief		Sm sleep aid night time Sominex maximum strength
Sm motion sickness relief	Sm nighttime sleep aid	Sominex	
Sm z-sleep	Solu-medrol	Tebamide	Tebamide pediatric
Sustol	Syndros	Tgt allergy melts childre	Tgt allergy relief
Tetra-formula nighttime s	Tgt allergy medication ch	Tgt sleep aid maximum str	Th allergy relief
Tgt allergy relief childr	Tgt nighttime sleep aid	Th rest simply	Th sleep aid
Th childrens allergy	Th motion relief	Tigan	Total allergy
Th sleep aid maximum stre	Theraflu multi symptom	Travel motion sickness	Travel sickness
Total allergy medicine	Transderm-scop	Trav-tabs	Triaminic childrens aller
Travel-ease	Travel-eze	Triptone	Twilite
Triaminic cough & runny n	Trimethobenzamide hcl	Univert	Vanamine pd
Unisom sleepgels	Unisom sleepmelts	Vistaril	Wal-dram
Varubi	Vertin-32	Wal-dryl allergy children	Wal-dryl allergy relief c Wal-som maximum strength
Wal-dram ii	Wal-dryl allergy	Wal-som	
Wal-sleep z	Wal-sleep z liquid shots		

Xanax	Xanax xr	Zema-pak 10 day	Zema-pak 13 day
Zema-pak 6 day	Zodex 12-day	Zodex 6-day	Zofran
Zofran odt	Zonacort 11 day	Zonacort 7 day	Zuplenz
Zyprexa	Zyprexa relprevv	Zyprexa zydis	Zzzquil

H12: RADIATION ONCOLOGY, HCPCS

HCPCS

31643	61796	61797	61798	61799	63620	63621	77371	77372
77373	77385	77386	77387	77401	77402	77403	77404	77406
77407	77408	77409	77411	77412	77413	77414	77416	77418
77422	77423	77520	77522	77523	77525	77750	77761	77762
77763	77767	77768	77770	77771	77772	77785	77786	77787
77789	77799	79101	79200	79403	79440	79445	0073T	0182T
0394T	0395T	G0251	G0339	G0340	G6003	G6004	G6005	G6006
G6007	G6008	G6009	G6010	G6011	G6012	G6013	G6014	G6015
G6016								

H13: RADIATION ONCOLOGY ICD-9 PROCEDURE CODES

ICD-9

1426	9220	9221	9222	9223	9224	9225	9226	9228
9229	9230	9231	9232	9233	9239			

H14: RADIATION ONCOLOGY ICD-10 PROCEDURE CODES

ICD-10								
0YHN41Z	3E0B304	3E0B704	3E0BX04	3E0C304	3E0C704	3E0CX04	3E0D304	3E0D704
3E0DX04	3E0E304	3E0E704	3E0E804	3E0F304	3E0F704	3E0F804	3E0G304	3E0G704
3E0G804	3E0H304	3E0H704	3E0H804	3E0J304	3E0J704	3E0J804	3E0K304	3E0K704
3E0K804	3E0L304	3E0L704	3E0M304	3E0M704	3E0N304	3E0N704	3E0N804	3E0P304
3E0P704	3E0P804	3E0Q304	3E0Q704	3E0R304	3E0S304	3E0U304	3E0Y304	3E0Y704
CW70NZZ	CW70YZZ	CW73NZZ	CW73YZZ	CW7GGZZ	CW7GYZZ	CW7N8ZZ	CW7NGZZ	CW7NNZZ
CW7NPZZ	CW7NYZZ	CW7YYZZ	D0000ZZ	D0001ZZ	D0002ZZ	D0003ZZ	D0004ZZ	D0005ZZ
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D0061ZZ	D0062ZZ	D0063ZZ	D0064ZZ	D0065ZZ	D0066ZZ	D0070ZZ	D0071ZZ	D0072ZZ
D0073ZZ	D0074ZZ	D0075ZZ	D0076ZZ	D01097Z	D01098Z	D01099Z	D0109BZ	D0109CZ
D0109YZ	D01197Z	D01198Z	D01199Z	D0119BZ	D0119CZ	D0119YZ	D01697Z	D01698Z
D01699Z	D0169BZ	D0169CZ	D0169YZ	D01797Z	D01798Z	D01799Z	D0179BZ	D0179CZ
D0179YZ	D020DZZ	D020HZZ	D020JZZ	D021DZZ	D021HZZ	D021JZZ	D026DZZ	D026HZZ
D026JZZ	D027DZZ	D027HZZ	D027JZZ	D0Y07ZZ	D0Y17ZZ	D0Y67ZZ	D0Y77ZZ	D7000ZZ
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D7119CZ	D7119YZ	D71297Z	D71298Z	D71299Z	D7129BZ	D7129CZ	D7129YZ	D71397Z
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D7149CZ	D7149YZ	D71597Z	D71598Z	D71599Z	D7159BZ	D7159CZ	D7159YZ	D71697Z
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D723HZZ	D723JZZ	D724DZZ	D724HZZ	D724JZZ	D725DZZ	D725HZZ	D725JZZ	D726DZZ
D726HZZ	D726JZZ	D727DZZ	D727HZZ	D727JZZ	D728DZZ	D728HZZ	D728JZZ	D8000ZZ
D8001ZZ	D8002ZZ	D8003ZZ	D8004ZZ	D8005ZZ	D8006ZZ	D81097Z	D81098Z	D81099Z
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D9002ZZ	D9003ZZ	D9004ZZ	D9005ZZ	D9006ZZ	D9010ZZ	D9011ZZ	D9012ZZ	D9013ZZ
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D90D4ZZ	D90D5ZZ	D90D6ZZ	D90F0ZZ	D90F1ZZ	D90F2ZZ	D90F3ZZ	D90F4ZZ	D90F5ZZ
D90F6ZZ	D91097Z	D91098Z	D91099Z	D9109BZ	D9109CZ	D9109YZ	D91197Z	D91198Z
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D9139YZ	D91497Z	D91498Z	D91499Z	D9149BZ	D9149CZ	D9149YZ	D91597Z	D91598Z
D91599Z	D9159BZ	D9159CZ	D9159YZ	D91697Z	D91698Z	D91699Z	D9169BZ	D9169CZ

D9169YZ	D91797Z	D91798Z	D91799Z	D9179BZ	D9179CZ	D9179YZ	D91897Z	D91898Z
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D927JZZ	D928DZZ	D928HZZ	D928JZZ	D929DZZ	D929HZZ	D929JZZ	D92BDZZ	D92BHZZ
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DD1399Z	DD139BZ	DD139CZ	DD139YZ	DD1497Z	DD1498Z	DD1499Z	DD149BZ	DD149CZ
DD149YZ	DD1597Z	DD1598Z	DD1599Z	DD159BZ	DD159CZ	DD159YZ	DD1797Z	DD1798Z
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DDY27ZZ	DDY37ZZ	DDY47ZZ	DDY57ZZ	DDY77ZZ	DF000ZZ	DF001ZZ	DF002ZZ	DF003ZZ
DF004ZZ	DF005ZZ	DF006ZZ	DF010ZZ	DF011ZZ	DF012ZZ	DF013ZZ	DF014ZZ	DF015ZZ
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DF1297Z	DF1298Z	DF1299Z	DF129BZ	DF129CZ	DF129YZ	DF1397Z	DF1398Z	DF1399Z
DF139BZ	DF139CZ	DF139YZ	DF20DZZ	DF20HZZ	DF20JZZ	DF21DZZ	DF21HZZ	DF21JZZ
DF22DZZ	DF22HZZ	DF22JZZ	DF23DZZ	DF23HZZ	DF23JZZ	DFY07ZZ	DFY17ZZ	DFY27ZZ
DFY37ZZ	DG000ZZ	DG001ZZ	DG002ZZ	DG003ZZ	DG005ZZ	DG006ZZ	DG010ZZ	DG011ZZ
DG012ZZ	DG013ZZ	DG015ZZ	DG016ZZ	DG020ZZ	DG021ZZ	DG022ZZ	DG023ZZ	DG025ZZ
DG026ZZ	DG040ZZ	DG041ZZ	DG042ZZ	DG043ZZ	DG045ZZ	DG046ZZ	DG050ZZ	DG051ZZ
DG052ZZ	DG053ZZ	DG055ZZ	DG056ZZ	DG1097Z	DG1098Z	DG1099Z	DG109BZ	DG109CZ
DG109YZ	DG1197Z	DG1198Z	DG1199Z	DG119BZ	DG119CZ	DG119YZ	DG1297Z	DG1298Z

DG1299Z	DG129BZ	DG129CZ	DG129YZ	DG1497Z	DG1498Z	DG1499Z	DG149BZ	DG149CZ
DG149YZ	DG1597Z	DG1598Z	DG1599Z	DG159BZ	DG159CZ	DG159YZ	DG20DZZ	DG20HZZ
DG20JZZ	DG21DZZ	DG21HZZ	DG21JZZ	DG22DZZ	DG22HZZ	DG22JZZ	DG24DZZ	DG24HZZ
DG24JZZ	DG25DZZ	DG25HZZ	DG25JZZ	DGY07ZZ	DGY17ZZ	DGY27ZZ	DGY47ZZ	DGY57ZZ
DH020ZZ	DH021ZZ	DH022ZZ	DH023ZZ	DH024ZZ	DH025ZZ	DH026ZZ	DH030ZZ	DH031ZZ
DH032ZZ	DH033ZZ	DH034ZZ	DH035ZZ	DH036ZZ	DH040ZZ	DH041ZZ	DH042ZZ	DH043ZZ
DH044ZZ	DH045ZZ	DH046ZZ	DH060ZZ	DH061ZZ	DH062ZZ	DH063ZZ	DH064ZZ	DH065ZZ
DH066ZZ	DH070ZZ	DH071ZZ	DH072ZZ	DH073ZZ	DH074ZZ	DH075ZZ	DH076ZZ	DH080ZZ
DH081ZZ	DH082ZZ	DH083ZZ	DH084ZZ	DH085ZZ	DH086ZZ	DH090ZZ	DH091ZZ	DH092ZZ
DH093ZZ	DH094ZZ	DH095ZZ	DH096ZZ	DH0B0ZZ	DH0B1ZZ	DH0B2ZZ	DH0B3ZZ	DH0B4ZZ
DH0B5ZZ	DH0B6ZZ	DHY27ZZ	DHY37ZZ	DHY47ZZ	DHY67ZZ	DHY77ZZ	DHY87ZZ	DHY97ZZ
DHYB7ZZ	DM000ZZ	DM001ZZ	DM002ZZ	DM003ZZ	DM004ZZ	DM005ZZ	DM006ZZ	DM010ZZ
DM011ZZ	DM012ZZ	DM013ZZ	DM014ZZ	DM015ZZ	DM016ZZ	DM1097Z	DM1098Z	DM1099Z
DM109BZ	DM109CZ	DM109YZ	DM1197Z	DM1198Z	DM1199Z	DM119BZ	DM119CZ	DM119YZ
DM20DZZ	DM20HZZ	DM20JZZ	DM21DZZ	DM21HZZ	DM21JZZ	DMY07ZZ	DMY17ZZ	DP000ZZ
DP001ZZ	DP002ZZ	DP003ZZ	DP004ZZ	DP005ZZ	DP006ZZ	DP020ZZ	DP021ZZ	DP022ZZ
DP023ZZ	DP024ZZ	DP025ZZ	DP026ZZ	DP030ZZ	DP031ZZ	DP032ZZ	DP033ZZ	DP034ZZ
DP035ZZ	DP036ZZ	DP040ZZ	DP041ZZ	DP042ZZ	DP043ZZ	DP044ZZ	DP045ZZ	DP046ZZ
DP050ZZ	DP051ZZ	DP052ZZ	DP053ZZ	DP054ZZ	DP055ZZ	DP056ZZ	DP060ZZ	DP061ZZ
DP062ZZ	DP063ZZ	DP064ZZ	DP065ZZ	DP066ZZ	DP070ZZ	DP071ZZ	DP072ZZ	DP073ZZ
DP074ZZ	DP075ZZ	DP076ZZ	DP080ZZ	DP081ZZ	DP082ZZ	DP083ZZ	DP084ZZ	DP085ZZ
DP086ZZ	DP090ZZ	DP091ZZ	DP092ZZ	DP093ZZ	DP094ZZ	DP095ZZ	DP096ZZ	DP0B0ZZ
DP0B1ZZ	DP0B2ZZ	DP0B3ZZ	DP0B4ZZ	DP0B5ZZ	DP0B6ZZ	DP0C0ZZ	DP0C1ZZ	DP0C2ZZ
DP0C3ZZ	DP0C4ZZ	DP0C5ZZ	DP0C6ZZ	DPY07ZZ	DPY27ZZ	DPY37ZZ	DPY47ZZ	DPY57ZZ
DPY67ZZ	DPY77ZZ	DPY87ZZ	DPY97ZZ	DPYB7ZZ	DPYC7ZZ	DT000ZZ	DT001ZZ	DT002ZZ
DT003ZZ	DT004ZZ	DT005ZZ	DT006ZZ	DT010ZZ	DT011ZZ	DT012ZZ	DT013ZZ	DT014ZZ
DT015ZZ	DT016ZZ	DT020ZZ	DT021ZZ	DT022ZZ	DT023ZZ	DT024ZZ	DT025ZZ	DT026ZZ
DT030ZZ	DT031ZZ	DT032ZZ	DT033ZZ	DT034ZZ	DT035ZZ	DT036ZZ	DT1097Z	DT1098Z
DT1099Z	DT109BZ	DT109CZ	DT109YZ	DT1197Z	DT1198Z	DT1199Z	DT119BZ	DT119CZ
DT119YZ	DT1297Z	DT1298Z	DT1299Z	DT129BZ	DT129CZ	DT129YZ	DT1397Z	DT1398Z
DT1399Z	DT139BZ	DT139CZ	DT139YZ	DT20DZZ	DT20HZZ	DT20JZZ	DT21DZZ	DT21HZZ
DT21JZZ	DT22DZZ	DT22HZZ	DT22JZZ	DT23DZZ	DT23HZZ	DT23JZZ	DTY07ZZ	DTY17ZZ
DTY27ZZ	DTY37ZZ	DU000ZZ	DU001ZZ	DU002ZZ	DU003ZZ	DU004ZZ	DU005ZZ	DU006ZZ
DU010ZZ	DU011ZZ	DU012ZZ	DU013ZZ	DU014ZZ	DU015ZZ	DU016ZZ	DU020ZZ	DU021ZZ
DU022ZZ	DU023ZZ	DU024ZZ	DU025ZZ	DU026ZZ	DU1097Z	DU1098Z	DU1099Z	DU109BZ
DU109CZ	DU109YZ	DU1197Z	DU1198Z	DU1199Z	DU119BZ	DU119CZ	DU119YZ	DU1297Z
DU1298Z	DU1299Z	DU129BZ	DU129CZ	DU129YZ	DU20DZZ	DU20HZZ	DU20JZZ	DU21DZZ
DU21HZZ	DU21JZZ	DU22DZZ	DU22HZZ	DU22JZZ	DUY07ZZ	DUY17ZZ	DUY27ZZ	DV000ZZ
DV001ZZ	DV002ZZ	DV003ZZ	DV004ZZ	DV005ZZ	DV006ZZ	DV010ZZ	DV011ZZ	DV012ZZ
DV013ZZ	DV014ZZ	DV015ZZ	DV016ZZ	DV1097Z	DV1098Z	DV1099Z	DV109BZ	DV109CZ
DV109YZ	DV1197Z	DV1198Z	DV1199Z	DV119BZ	DV119CZ	DV119YZ	DV20DZZ	DV20HZZ
DV20JZZ	DV21DZZ	DV21HZZ	DV21JZZ	DVY07ZZ	DVY17ZZ	DW010ZZ	DW011ZZ	DW012ZZ
DW013ZZ	DW014ZZ	DW015ZZ	DW016ZZ	DW020ZZ	DW021ZZ	DW022ZZ	DW023ZZ	DW024ZZ
DW025ZZ	DW026ZZ	DW030ZZ	DW031ZZ	DW032ZZ	DW033ZZ	DW034ZZ	DW035ZZ	DW036ZZ
DW040ZZ	DW041ZZ	DW042ZZ	DW043ZZ	DW044ZZ	DW045ZZ	DW046ZZ	DW050ZZ	DW051ZZ
DW052ZZ	DW053ZZ	DW054ZZ	DW055ZZ	DW056ZZ	DW060ZZ	DW061ZZ	DW062ZZ	DW063ZZ
DW064ZZ	DW065ZZ	DW066ZZ	DW1197Z	DW1198Z	DW1199Z	DW119BZ	DW119CZ	DW119YZ
DW1297Z	DW1298Z	DW1299Z	DW129BZ	DW129CZ	DW129YZ	DW1397Z	DW1398Z	DW1399Z

DW139BZ	DW139CZ	DW139YZ	DW1697Z	DW1698Z	DW1699Z	DW169BZ	DW169CZ	DW169YZ
DW21DZZ	DW21HZZ	DW21JZZ	DW22DZZ	DW22HZZ	DW22JZZ	DW23DZZ	DW23HZZ	DW23JZZ
DW26DZZ	DW26HZZ	DW26JZZ	DWY17ZZ	DWY27ZZ	DWY37ZZ	DWY47ZZ	DWY57ZZ	DWY5GDZ
DWY5GFZ	DWY5GGZ	DWY5GHZ	DWY5GYZ	DWY67ZZ				

H15: TRANSPLANT, HCPCS

HCPCS

38240	38241
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H16: TRANSPLANT, MS-DRGS

MS DRGs Description

014	Allogeneic Bone Marrow Transplant
015	Autologous Bone Marrow Transplant
016	Autologous Bone Marrow Transplant w CC/MCC
017	Autologous Bone Marrow Transplant w/o CC/MCC

H17: TRANSPLANT ICD-9 PROCEDURE CODES

ICD-9

4100	4101	4102	4103	4104	4105	4106	4107	4108
4109								

H18: TRANSPLANT ICD-10 PROCEDURE CODES

ICD-10

30230AZ	30230G0	30230G1	30230G2	30230G3	30230G4	30230X0	30230X1	30230X2
30230X3	30230X4	30230Y0	30230Y1	30230Y2	30230Y3	30230Y4	30233AZ	30233G0
30233G1	30233G2	30233G3	30233G4	30233X0	30233X1	30233X2	30233X3	30233X4
30233Y0	30233Y1	30233Y2	30233Y3	30233Y4	30240AZ	30240G0	30240G1	30240G2
30240G3	30240G4	30240X0	30240X1	30240X2	30240X3	30240X4	30240Y0	30240Y1
30240Y2	30240Y3	30240Y4	30243AZ	30243G0	30243G1	30243G2	30243G3	30243G4
30243X0	30243X1	30243X2	30243X3	30243X4	30243Y0	30243Y1	30243Y2	30243Y3
30243Y4	30250G0	30250G1	30250X0	30250X1	30250Y0	30250Y1	30253G0	30253G1
30253X0	30253X1	30253Y0	30253Y1	30260G0	30260G1	30260X0	30260X1	30260Y0
30260Y1	30263G0	30263G1	30263X0	30263X1	30263Y0	30263Y1		

H19: TRANSFUSION, HCPCS

HCPCS

36430

H20: TRANSFUSION, REVENUE CODES

Revenue Codes

0380	0381	0382	0383	0384	0385	0386	0387	0389
0390	0391	0392	0399					

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