MILLIMAN RESEARCH REPORT

The cost burden of blood cancer care

A longitudinal analysis of commercially insured patients diagnosed with blood cancer

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Executive Summary

A blood cancer diagnosis means high spending, both by payers and patients. These costs are driven by many factors across the healthcare system including service utilization, insurance coverage, and the use of in-network or out-of-network providers. This study offers metrics on the cost of blood cancer care that we hope will inform payers, providers, patients, patient advocates and policymakers.

This study identifies the total healthcare allowed spending and patient out-of-pocket (OOP) costs from the year before a diagnosis of blood cancer through the three years after diagnosis. For this study, allowed spending is defined as amounts paid by payers and patients combined, non-inclusive of spending outside the realm of insurance coverage; most of the cost burden described by allowed spending falls on payers. We believe this is the first publication to present such information. We examine five blood cancer categories: acute leukemia, chronic leukemia, lymphoma, multiple myeloma, and bone marrow disorders (including precursors for leukemia like myelodysplastic syndrome, or MDS).Patients with leukemia face notably different treatment courses with different health system cost drivers depending on their specific diagnosis. For this reason, we chose to analyze acute leukemia and chronic leukemia as separate categories in this study. We identify newly diagnosed patients covered by commercial insurance and examine the composition of spending by and on behalf of these patients. While we isolate services directly related to cancer treatment, we also summarize all other health services to present a comprehensive view of how these patients interact with the current healthcare system.

Using real-world claims data of people with commercial insurance, we performed a longitudinal study of 2,332 blood cancer patients with an initial diagnosis in 2014. Our analysis shows that:

- ***Blood cancer care is very expensive to the healthcare system*:** The average annual allowed spending for treating blood cancer is $156,000 per patient in the first year following diagnosis. The high spending persists beyond the first year.
    - The magnitude of spending varies widely with cancer type: Over the three years following diagnosis, patients had a cumulative average allowed spending that ranged from $200,000 for chronic leukemia to over $800,000 for acute leukemia. By comparison, the average cumulative cost in the 36 months from diagnosis for lung cancer was $250,000 and slightly less than $150,000 for colorectal cancer. [1]
    - Allowed spending does not return to pre-diagnosis levels. The average allowed spending in 2014 per blood cancer patient pre-diagnosis was $1,600 per month or lower. This average, although higher than the average commercial member allowed spending ($343 per member per month), was low compared to post-diagnosis levels.[2] Even in the third year after diagnosis, blood cancer patients had average allowed spending between $3,500 and $4,500 per month, well above their pre-cancer levels.
- ***Services that drive total allowed spending differ from those that drive patient OOP costs***: Services billed by inpatient hospitals contributed the most to total allowed spending in the month of diagnosis but other service types contribute more as time goes on.

- Among the treatment therapies studied, anticancer drug therapy accounted for one-third of all allowed spending. Stem cell transplants contributed as much as a quarter of allowed spending across the total blood cancer patient population, predominantly in the fourth through sixteenth months (months 3 to 15 in our study) following diagnosis.
- Patient OOP costs, however, were mostly driven by professional services (35% of all OOP costs in first 12 months following diagnosis), and to a lesser degree by services rendered in outpatient hospital settings (25% of all OOP costs in first 12 months). Professional services also had the highest portion of out-of-network service costs.

- ***Very high spending occurs immediately after diagnosis*:** In the month of diagnosis, average monthly allowed spending per patient ranged from about $12,000 for chronic leukemia to about $117,000.
- ***Patient OOP costs are high and are impacted by plan type and month of diagnosis*:** Patient OOP costs for blood cancer care average thousands of dollars per year and are strongly influenced by the patient's insurance cost sharing. Patient OOP costs were highest in the month of diagnosis.
    - *Plan type:* Patients enrolled in high-deductible plans spent on average almost twice as much in patient OOP costs as those enrolled in traditional plans. The greatest differences between high-deductible and traditional plan patient OOP costs were found for services rendered by professional and outpatient hospital services.
    - *Month of diagnosis*: Patient OOP costs for blood cancer care spiked at diagnosis and then again at the beginning of each calendar year. This is due to the deductible and out-of-pocket limit that must be met each annual benefit cycle, which are typically calendar year cycles.

This report was commissioned by the Leukemia & Lymphoma Society (LLS), which received support for this work from Pfizer, Inc., Genentech, Inc., and Amgen, Inc. The findings and conclusions reflect the opinion of the authors; Milliman does not endorse any policy. If this report is reproduced, we ask that it be reproduced in its entirety, as pieces taken out of context can be misleading.

As with any economic or actuarial analysis, it is not possible to capture all factors that may be significant. We present national average data based on the 2013-2016 Truven Health MarketScan® commercial databases, which is representative of large group employer-sponsored insurance. These plans typically provide more generous benefits than small group and individual insurance. Therefore, these findings should be interpreted carefully before they are applied to any particular situation. 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. Gabriela Dieguez is a member of the American Academy of Actuaries and meets its qualification standards to issue this communication.

Background

According to the National Cancer Institute Surveillance, Epidemiology, and End Results (SEER) Program registry, over 174,000 patients under the age of 65 in the United States will receive a diagnosis of lymphoma, myeloma, or leukemia this year.[3] Five-year survival rates vary by cancer type, with leukemia as a whole being the deadliest (66.5% five-year survival) and Hodgkin's lymphoma the least deadly (92.4% five-year survival). Leukemia, the most common form of pediatric cancer, accounts for 29% of all childhood (ages 0-14) cancers, with acute myeloid leukemia as the deadliest of the SEER-tabulated sources, with a current five-year survival of only 65% among children. Despite these statistics, SEER also reports that blood cancer death rates have declined by over 2% from 2011 to 2015.[4] Literature suggests that children who successfully achieve remission have long-term costs associated with surveillance, long-term side effects of treatment, and recurrence.[5] Increased survivorship means more patients will need healthcare services in the years after diagnosis. For example, literature suggests that children who successfully achieve remission have long-term costs associated with surveillance, long-term side effects of treatment, and recurrence.[6]

Mitigating the blood cancer care burden to the healthcare system and on patients and their families requires all stakeholders to understand where the costs lie, especially for treatment paths that are unique to the blood cancers. In the United States in 2014, the year this study's cohort was diagnosed, total healthcare expenditures for cancer were estimated to be $87 billion, with the largest expenditures paid for hospital outpatient or office-based provider visits (58%) and inpatient admissions (27%).[7] Anticancer treatments vary by type of treatment, cancer, and stage. For many common tumor-based cancers, such as breast and colorectal, lower stage treatment often includes surgery, many times in conjunction with chemotherapy and/or radiation, but late-stage treatments typically use chemotherapy and/or radiation without surgery.[8] For cancers that are systemic, such as the blood and lymphatic cancers studied in this analysis, patients typically receive anticancer drug therapies, such as immunotherapy or chemotherapy, with an initial administration sometimes occurring in an inpatient setting.

Lack of insurance coverage also presents an obstacle to care. The implementation of the Patient Protection and Affordable Care Act (ACA) removed some of these obstacles by abolishing preexisting condition limitations, establishing caps on annual patient out-of-pocket (OOP) costs, providing premium subsidies for exchange insurance coverage, expanding Medicaid coverage, and allowing dependents to remain covered on parents' health insurance until turning 26.[9,10]

This study's goal is to assess the cost drivers to the healthcare system in treating blood cancers. We first summarize the treatments and cost for commercially insured patients with blood cancers in 2016. To better understand how costs vary over time, we conducted a longitudinal analysis for adults diagnosed with blood cancer in 2014 and followed through 2016. While we summarize blood cancers as a whole, we also distinguish among five main types: acute leukemia, chronic leukemia, lymphoma, multiple myeloma, and bone marrow disorders.

This report examines, for five types of blood cancer, the many differences in treatments and spending patterns for newly diagnosed patients with commercial insurance.

Findings

This section analyzes the care spectrum of blood cancer patients with commercial insurance. We examine the current state of blood cancer by reporting on two population cohorts: patients with an existing blood cancer diagnosis in 2016, and patients with an initial blood cancer diagnosis in 2014. The analysis of the first cohort provides a snapshot of all patients living with blood cancer at a given time, while a longitudinal study of the second cohort allows for a more nuanced view of a patient's journey from diagnosis through treatment.

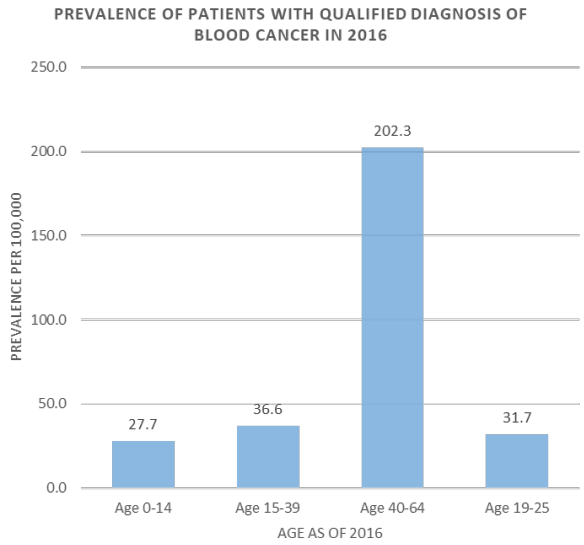
We summarize our findings for three aspects of cancer care costs: total healthcare allowed spending (amount paid by payer and patient combined), patient OOP costs (coinsurance, copay, and deductible), and the impact on those costs of insurance features, including deductibles, patient OOP maximums, and networks. Dollars are presented without trend.

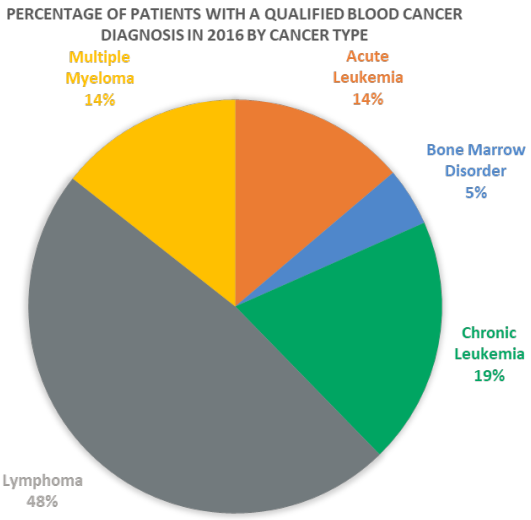
PREVALENCE AND COST OF BLOOD CANCER BY AGE GROUP

Prevalence is a measure to indicate the percentage of a population living with a disease. Based on the analysis of Truven Health Marketscan® commercial data (Marketscan) in 2016, we identified 25,658 patients with a diagnosis of acute leukemia, chronic leukemia, lymphoma, multiple myeloma, or bone marrow disorder. This translates to a prevalence rate of blood cancer of one in every 1,000 commercially insured lives, consistent with published statistics from the SEER Program on these cancers.[11]

Figure 1 summarizes the 2016 calculated prevalence rates for patients broken out by age (0-14, 15-39, and 40-64) and cancer type. Almost half (48%) of the prevalent population is diagnosed with lymphoma, and overall blood cancer prevalence in older patients is six times higher than in younger patients.

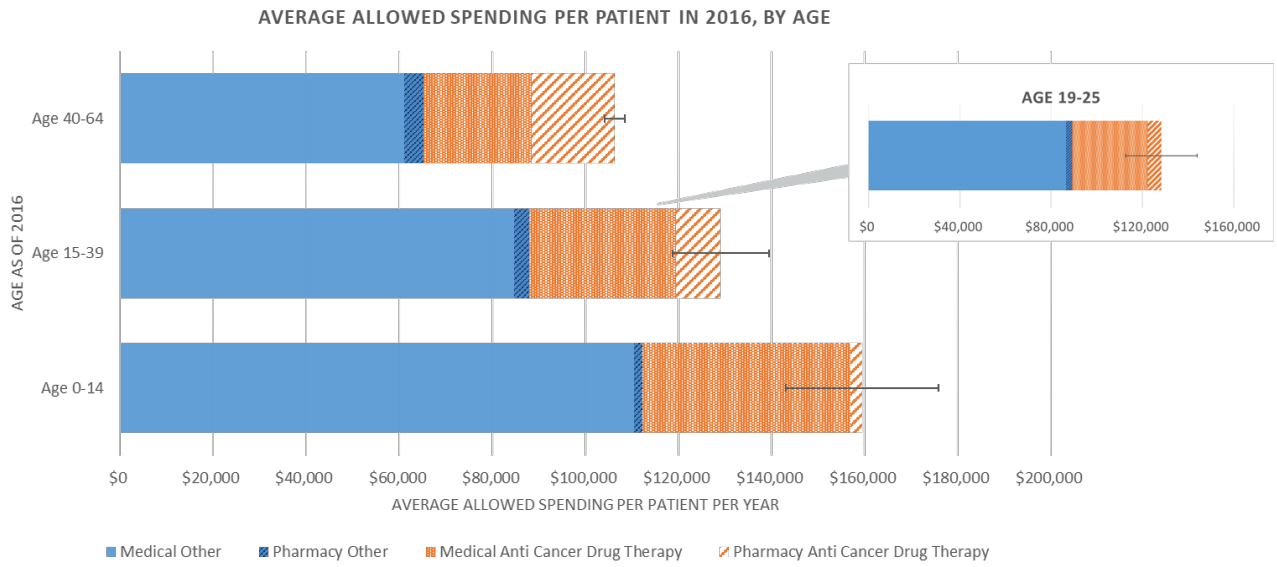
FIGURE 1: PREVALENT COMMERCIAL BLOOD CANCER POPULATION IN 2016





On average, a blood cancer patient incurred more than $112,000 in allowed spending in 2016. However, spending varied by age, with the youngest patients incurring the highest (average $160,000) and the oldest the lowest (average $106,000). Figure 2 reports the average annual allowed spending on medical and pharmacy services in 2016, by age. Anticancer drug therapy, which includes chemotherapy, biologic agents, and immunotherapy, is currently the predominant treatment for most blood cancers.[12,13,14,15] In this study, we grouped all costs associated with these treatments with their corresponding supportive therapies (e.g., hematopoietic agents) and administration. As a whole, these services accounted for over 37% of all costs incurred in the year.

FIGURE 2: AVERAGE ANNUAL ALLOWED SPENDING PER BLOOD CANCER PATIENT IN 2016



Note: Horizontal bars represent the 95% confidence interval around the mean.

Patients 19 to 25 years old represent a cohort of interest as a revocation of the ACA could jeopardize their current insurance coverage as dependents. We found this particular cohort to be very similar to the ages 15-39 cohort, with a prevalence rate of 31.7 per 100,000 and an average annual cost of almost $130,000.

INCIDENCE OF BLOOD CANCER

Incidence is a measure of the probability of occurrence of a given disease. We identified 2,332 adult patients with an initial diagnosis of blood cancer in 2014. This translates to an incident rate of blood cancer of about 0.3 per 1,000 commercially insured lives. This rate is slightly higher than SEER's reported incidence (which we adjusted for our age range).[16,17]

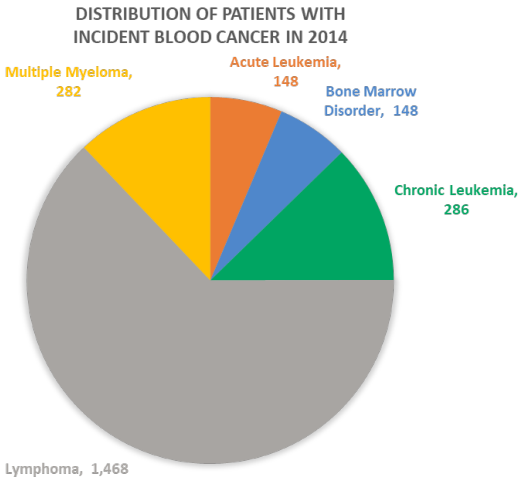
The table in Figure 3 shows the selection process to arrive at the final analysis cohort. From a starting population of almost 8.3 million adult members in MarketScan, we identified 21,570 patients with at least one diagnosis of blood cancer in 2014. Of these patients, 11% (2,332) were identified as having an initial blood cancer diagnosis in 2014.[18] Cancer type and treatment protocols differ between pediatric and adult patients.[19] However, we did not identify enough pediatric blood cancer patients within each blood cancer type to support individual analysis and thus limited this portion of the study to patients 18 to 64 years of age.

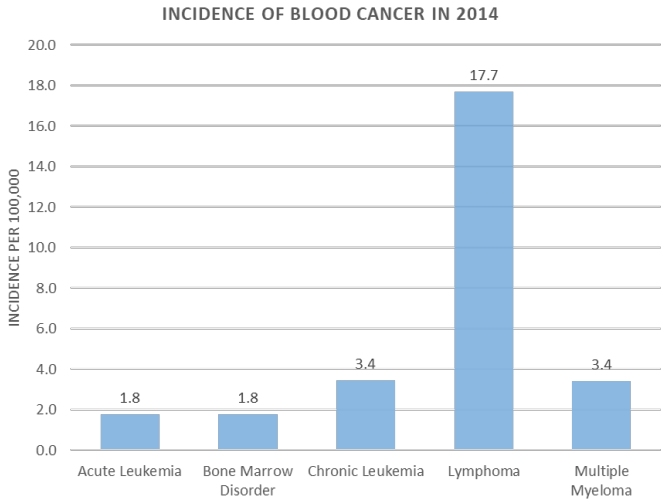
FIGURE 3: SELECTION OF THE ANALYSIS COHORT: NEWLY DIAGNOSED BLOOD CANCER PATIENTS IN 2014

	Members
2014 Truven Health MarketScan® population	44,948,787
Has coverage in 2013/2014/2015	10,975,758
Age 64 or younger as of 2016	10,779,334
Age 18 and above in 2014	8,299,025
Has a blood cancer diagnosis in 2014	21,570
First diagnosis in 2014 was not a code for relapse or remission	19,914
No prior blood cancer diagnosis or treatment one year prior to the index date	7,603
Has second blood cancer diagnosis within 60 days of first diagnosis	**2,332**

Patients diagnosed with lymphoma represent the largest portion of patients (63%) in the 2014 analysis cohort. This is followed by chronic leukemia (12%) and multiple myeloma (12%). Patients with acute leukemia and bone marrow disorders, at 6% each, represent the smallest fractions of the cohort. Figure 4 depicts the makeup of the analysis cohort as well as the observed incidence rates per 100,000 commercially insured adults. These incidence rates are consistent with published SEER rates.

FIGURE 4: NEWLY DIAGNOSED BLOOD CANCER PATIENTS IN 2014 BY CANCER TYPE AND OBSERVED INCIDENCE



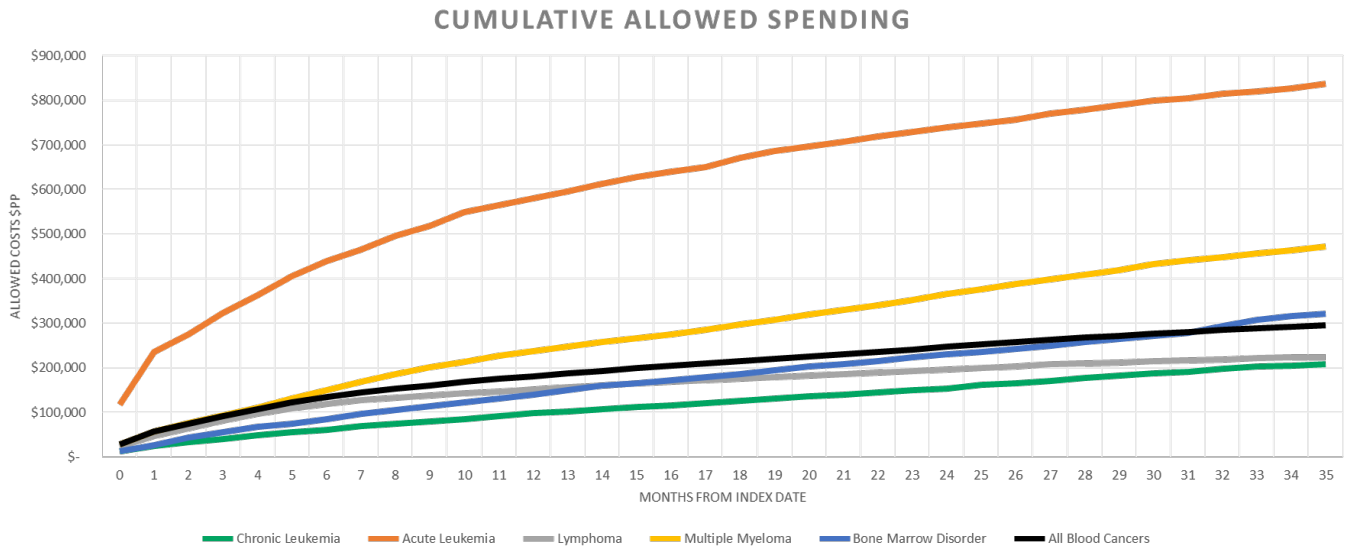


BLOOD CANCER CARE SPENDING FOLLOWING INITIAL DIAGNOSIS

We performed a longitudinal analysis of blood cancer patients from date of diagnosis in 2014 through the end of 2016. The magnitude of blood cancer allowed spending varies greatly by the type of cancer. Over the three years following their initial blood cancer diagnoses, surviving patients incurred allowed spending of between $200,000 (chronic leukemia) and more than

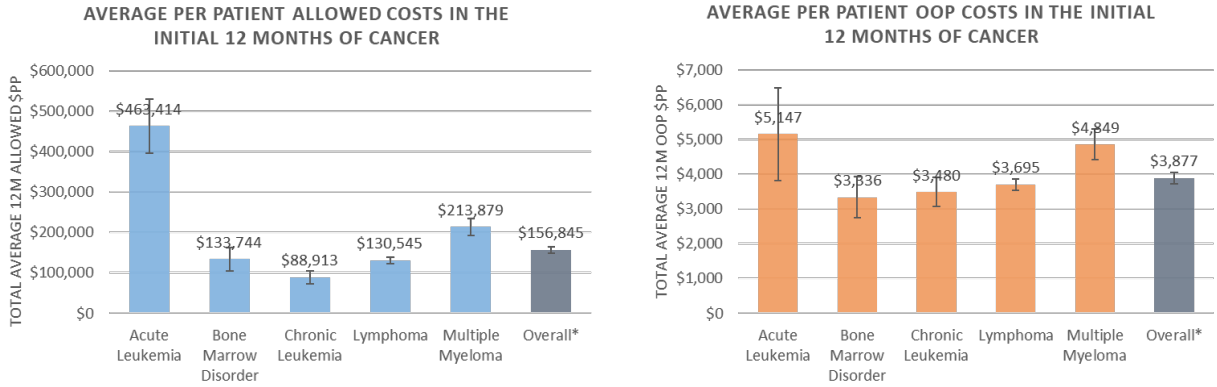
$800,000 (acute leukemia). Figure 5 illustrates the cumulative allowed spending incurred by these patients from the month of diagnosis (month 0) to the latest available month of analysis (month 35).

FIGURE 5: CUMULATIVE ALLOWED SPENDING PER PATIENT AMONG BLOOD CANCER TYPES, FROM MONTH OF DIAGNOSIS (2014-2016)



When we focus on the first year following diagnosis, acute leukemia patients incurred the highest allowed spending and patient OOP costs. Allowed spending for acute leukemia patients ($463,414) was almost three times greater than the overall average for all blood cancers ($156,845). However, insurance design features such as deductibles and patient OOP maximums largely reduce the differences in patient OOP costs by blood cancer type. Out-of-pocket costs for acute leukemia patients ($5,147) were 32% higher than the overall average ($3,877). Figure 6 illustrates the differences in OOP costs.

FIGURE 6: AVERAGE ALLOWED SPENDING AND OUT-OF-POCKET COSTS PER PATIENT IN THE FIRST 12 MONTHS FOLLOWING INITIAL DIAGNOSIS (2014-2015)



* Overall averages are calculated across all 2,332 patients and are not an average of the five cancers.

Notes:

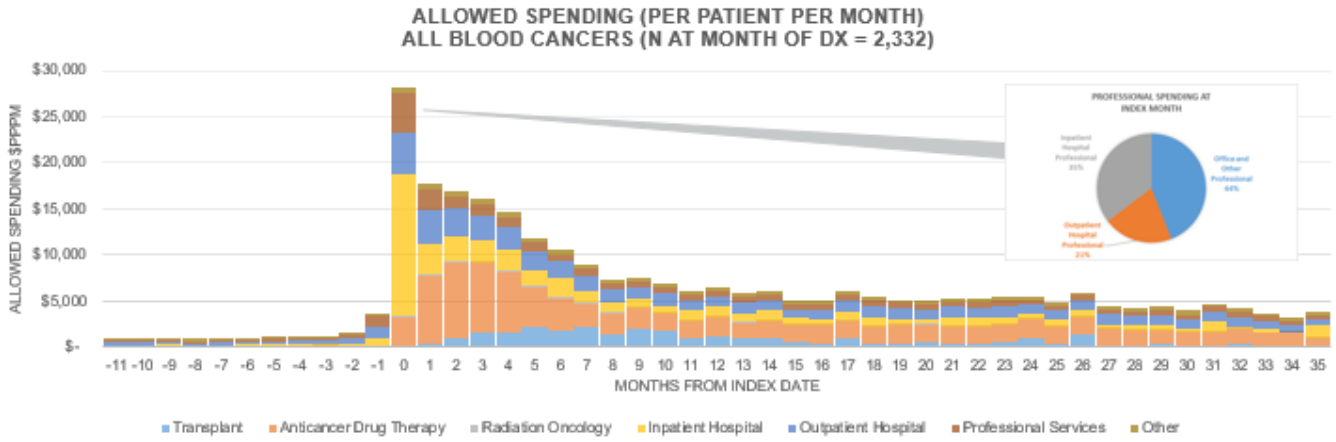
Patients in our cohort had an average 10.5 months of exposure in the year following their diagnoses. Therefore, the values reported here will differ from the 12-month cumulative allowed spending presented in Figure 5 above, which represents accumulated monthly averages in the data each month for patients who survive.

Vertical bars represent the 95% confidence interval around the mean.

Patients receive costly treatments for a wide variety of services. To illustrate how the services received by blood cancer patients vary over time, we analyzed the allowed spending by month after diagnosis. We identified allowed spending associated with the three main types of blood cancer treatment: anticancer drug therapy, transplants including both bone marrow and stem cell, and radiation oncology. Outside of these therapies, we summarize dollars based on the billing entity: 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 below for details on how these claims were identified and assigned.

Inpatient hospital services comprise the largest share (55%) of total allowed spending in the month of diagnosis. In the months that follow, anticancer drug therapy accounts for roughly one-third of total allowed spending (see Figure 7). While allowed spending levels do decrease over time following diagnosis, they never return to “before diagnosis” levels (months -11 to -2). The professional service category comprises services associated with an inpatient hospital or outpatient hospital encounter, such as an inpatient hospital visit by a physician or a surgeon billing for a facility-based procedure, as well as office-based and other care services. In the month of diagnosis, we highlight the distribution across these three categories. On average, the majority of these services (56%) are professionals billing for services provided in conjunction with either an inpatient or outpatient hospital encounter.

FIGURE 7: ALLOWED SPENDING PER BLOOD CANCER PATIENT PER MONTH, BY TYPE OF SERVICE (2014-2016)



While the month of diagnosis remains the most costly in terms of allowed spending, the composition and persistence of those costs do differ across cancer types. Appendix B provides the monthly allowed spending for each individual cancer. We highlight key findings from these figures below.

- **Acute leukemia and multiple myeloma are the costliest blood cancers.** In the month of diagnosis, acute leukemia patients report the highest costs billed by inpatient hospitals (six times higher than other cancers). Acute leukemia patients also report the highest average allowed spending in the month of diagnosis (just under $120,000). By comparison, multiple myeloma is the second costliest cancer in the month of diagnosis with an average allowed spending per patient of $28,000. Acute leukemia and multiple myeloma report the highest sustained post-diagnosis allowed spending, with average monthly costs over $10,000 in the second year following diagnosis.
- **Anticancer drug therapy is used across all cancers but in varying degrees.** Anticancer drug therapy had meaningful impact on spending across all cancer types but in different ways. These services are predominantly incurred in the first six months following diagnosis for acute leukemia and lymphomas. By contrast, utilization of anticancer drug therapy persisted throughout the three years of the study for chronic leukemia and multiple myeloma patients. Even two and a half years after diagnosis (months 30 to 35 in our study), anticancer drug therapy on average contributed close to two thirds of total allowed spending for multiple myeloma patients and over half for chronic leukemia patients.
- **Transplants contribute as much as a quarter of monthly allowed spending in some months**. The majority of transplants costs occurred in the fourth through sixteenth months following diagnosis (months 3 to 15 of our study) and contributed between 10% and 26% of average monthly allowed spending during these months. Patients diagnosed

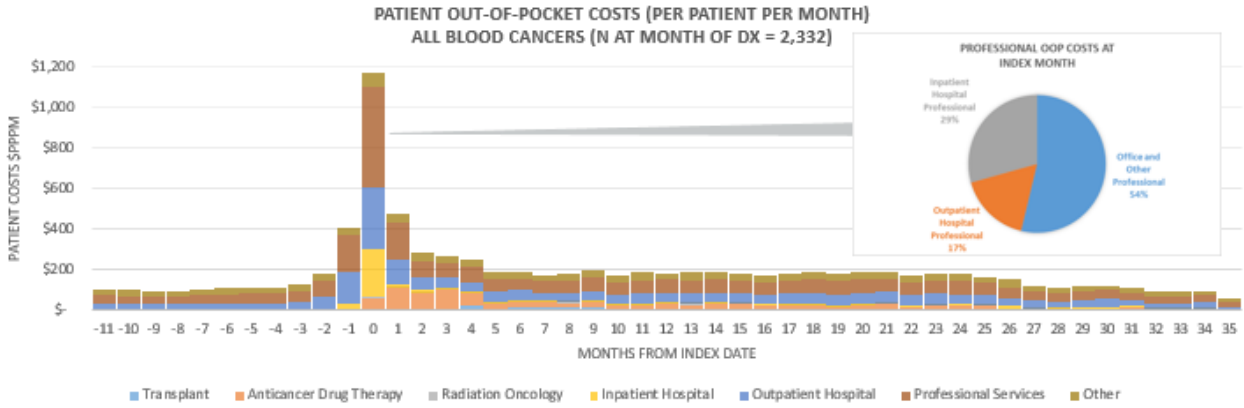
with multiple myeloma reported the most utilization of this type of service while lymphoma patients reported the least.

- **In the month of diagnosis, professional fees primarily occurred in different settings depending on cancer type.** Acute leukemia and multiple myeloma patients incur the highest level of professional services provided in an inpatient hospital, at 69% and 41% of total professional allowed spending, respectively. By contrast, chronic leukemia and bone marrow disorders patients report the most non-facility-based professional allowed spending in the month of diagnosis, at 68% and 52%, respectively.

PATIENT OUT-OF-POCKET COSTS FOLLOWING A BLOOD CANCER DIAGNOSIS

Patient OOP costs following the initial blood cancer diagnosis vary over time, along with the components of these costs. Figure 8 shows average patient OOP costs per month. Consistent with total allowed spending, patient OOP costs peak at the month of diagnosis. Services billed by professionals contributed to over half of all patient OOP costs, despite inpatient hospital bills contributing to one-third of total allowed spending.

FIGURE 8: BLOOD CANCER PATIENT OUT-OF-POCKET COSTS PER MONTH, BY TYPE OF SERVICE (2014-2016)



While the magnitude of patient OOP costs vary by type of cancer, professional services consistently contribute the largest portion of OOP cost over time. Appendix C provides the average monthly patient OOP costs for each individual cancer. We highlight key findings from these analyses below.

- **Acute leukemia patients have the highest OOP costs around the time of diagnosis, but multiple myeloma patients incur more OOP costs over time.** The average patient OOP costs for acute leukemia in the month of diagnosis were $1,637, with accumulated total patient OOP costs for the three years after diagnosis of $8,797. Multiple myeloma patients incurred $1,210 in OOP costs in the month of diagnosis, but

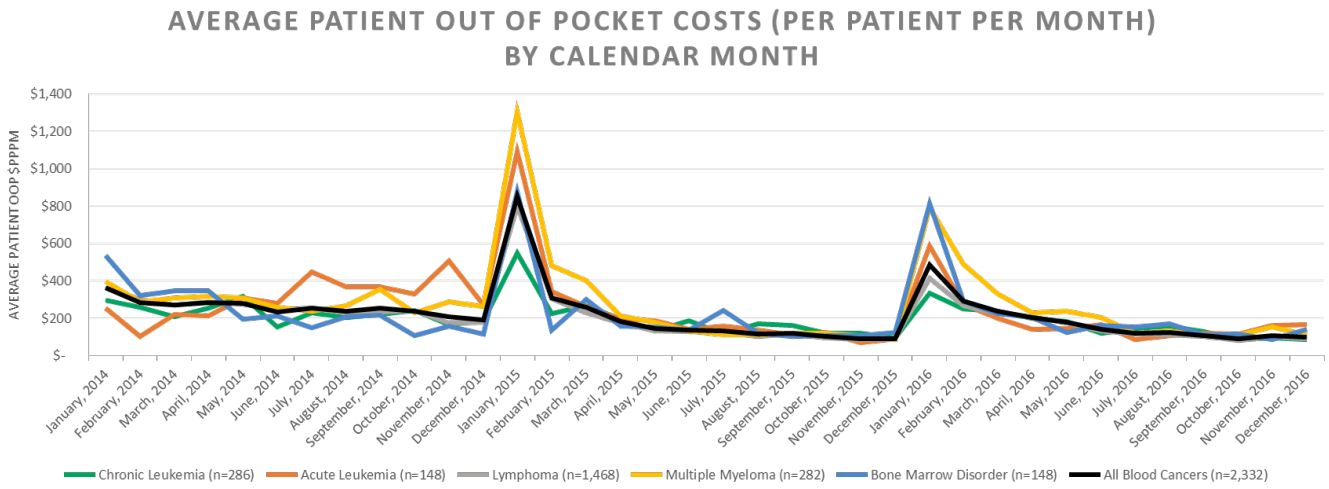
their cumulative three-year OOP costs totaled $9,127. Other blood cancers reported average three-year accumulated patient OOP costs under $7,800.

- **Professional services drive patient OOP costs, but type of professional services differ by cancer type.** Professional services not associated with a facility encounter (inpatient or outpatient hospital) contributed the majority of professional patient OOP costs for both chronic leukemia (74%) and bone marrow disorder (65%) patients in the month of diagnosis, while professional services associated with inpatient admissions contributed the majority (62%) of professional patient OOP costs for acute leukemia. For the remaining cancer types, facility and non-facility (office and other) professional services contributed relatively equal amounts to the month of diagnosis professional patient OOP costs.
- **Acute leukemia inpatient admissions contribute almost as much as professional services to total patient OOP costs in the month of diagnosis.** For acute leukemia, 42.5% of patient OOP costs in the month of diagnosis are attributed to professional services and 41.6% are attributed to inpatient hospital admissions. In comparison, inpatient admissions contribute less than 20% to the patient OOP costs in the month of diagnosis for all other cancer types.

The impact of insurance plan design on patient OOP costs

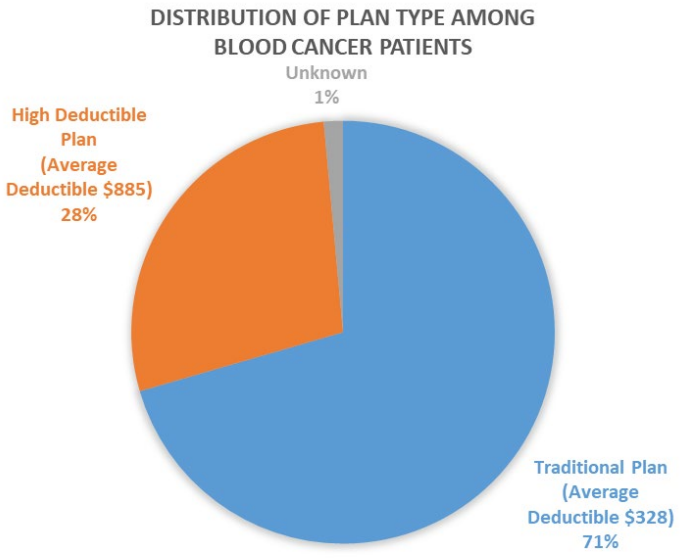
Insurance plan designs have significant impacts on patient OOP costs. Cost-sharing features typically consist of deductibles, copays, coinsurance, and patient OOP maximums. Deductibles and OOP maximums are renewed each plan year, creating a seasonal effect on patient OOP costs. Figure 9 shows patient OOP costs by calendar month. Costs spike at the beginning of each calendar year, reflecting the initiation of a new benefit cycle and the requirement to satisfy annual deductibles. Costs decline toward the end of each calendar year as patients exhaust their annual deductibles and perhaps reach the annual OOP maximum.

FIGURE 9: AVERAGE OUT-OF-POCKET COSTS PER BLOOD CANCER PATIENT, PER CALENDAR MONTH (2014-2016)



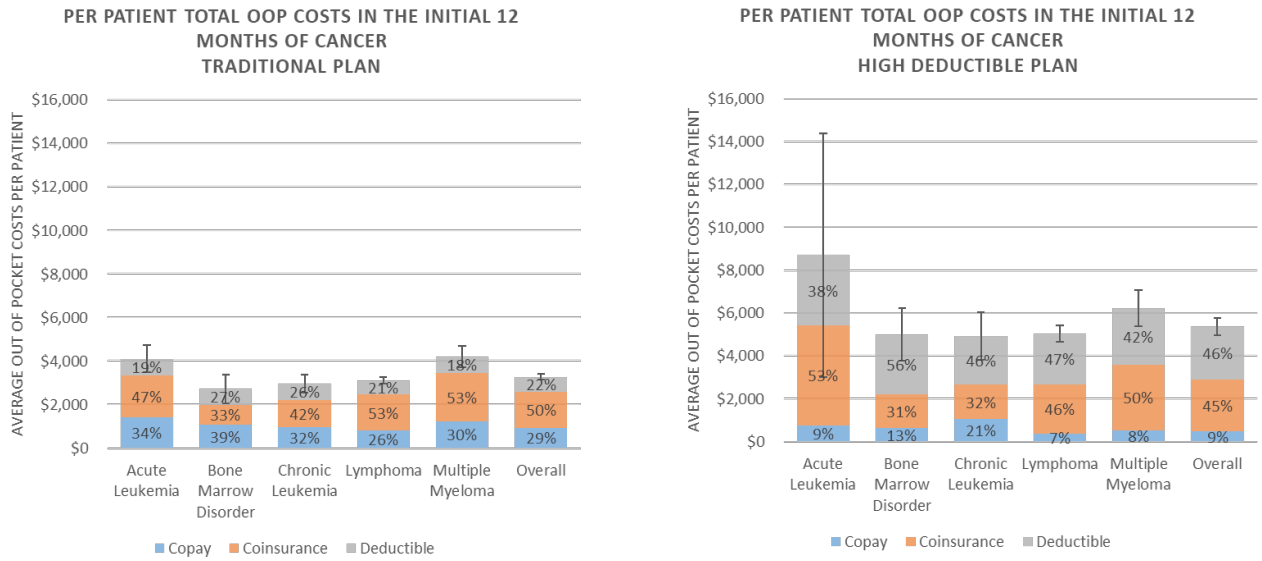
The type of insurance plan design, whether traditional or high-deductible, also influences patient OOP costs. Dictated by the Internal Revenue Service (IRS), high-deductible plans in 2014 are those with annual deductibles of $1,250 or more for individual coverage and $2,500 or more for family coverage.[20] We determined that 28% of the analysis cohort was enrolled in a high-deductible plan (Figure 10) in the year of diagnosis, while the rest of the patients were enrolled in traditional plans with individual deductibles under $1,250 or family deductibles under $2,500. The proportion of patients with high-deductible plans was consistent across blood cancer types.

FIGURE 10: DISTRIBUTION OF PLAN TYPE AMONG INCIDENT BLOOD CANCER PATIENTS IN 2014



Blood cancer patients enrolled in high-deductible plans pay considerably more OOP costs in the first 12 months following their diagnoses. Overall, patients enrolled in high-deductible plans have 64% higher OOP costs than patients enrolled in traditional plans ($5,368 vs. $3,270). This disparity is most notable for acute leukemia patients, where patient OOP costs for those enrolled in high-deductible plans are more than double that for patients enrolled in traditional plans (Figure 11). In particular, acute leukemia reports a very large amount of variability surrounding the average patient OOP costs in the first year after diagnosis.

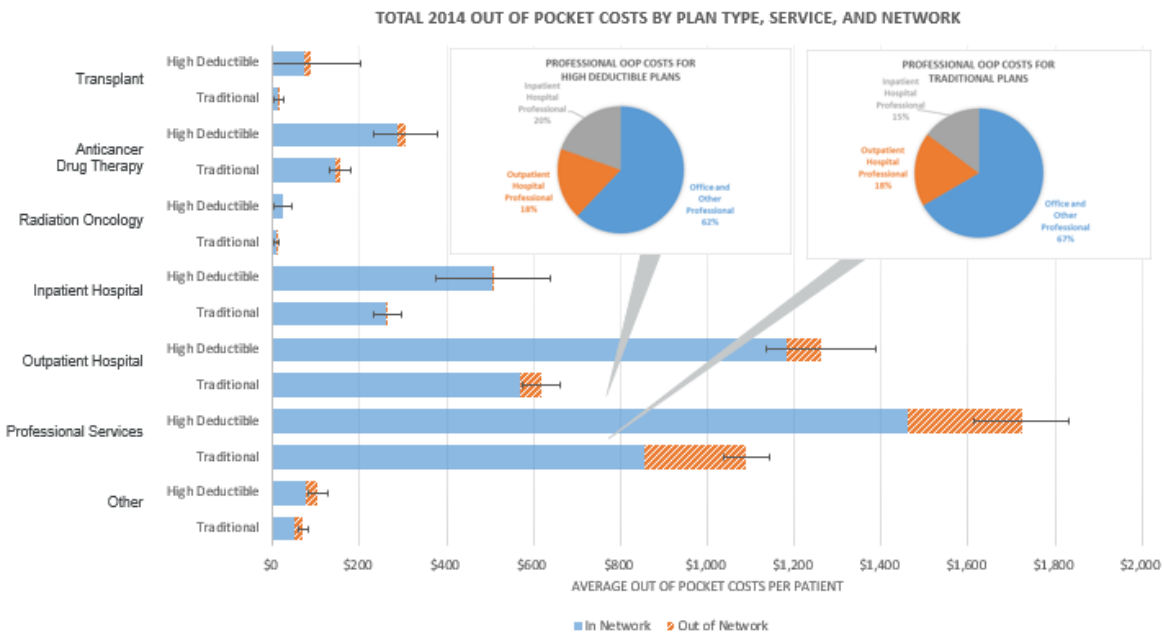
FIGURE 11: TOTAL OUT-OF-POCKET PATIENT COSTS IN THE 12 MONTHS FOLLOWING A BLOOD CANCER DIAGNOSIS, BY PLAN TYPE (2014-2015)



Note: Vertical bars represent the 95% confidence interval around the mean.

To further explore the impact of plan type on patient OOP costs for blood cancer patients, we analyzed patient OOP costs by type of service. Figure 12 summarizes the patient OOP costs in calendar year 2014, representing a complete benefit cycle for the year of diagnosis. Patients with high-deductible plans pay considerably more than patients in traditional plans, with the greatest differences observed for claims billed by professionals and outpatient hospitals.

FIGURE 12: BLOOD CANCER PATIENT OUT-OF-POCKET COSTS IN THE YEAR OF DIAGNOSIS (2014), BY PLAN TYPE, SERVICE, AND NETWORK



Patients utilizing out-of-network (OON) services incur larger patient OOP costs than those utilizing services within a plan's network. To measure the impact of OON utilization on patient OOP costs, we report dollars separately by network status in Figure 12. We found that patients mostly encounter OON providers for services billed by professionals and, to a lesser extent, outpatient hospitals in the year of diagnosis.

To understand how OON provider utilization by blood cancer patients evolves over time, we reviewed monthly patient OOP costs by network status. In the month of diagnosis, which reports the highest average patient OOP costs, about $1,200 (or 12%) of those costs are attributed to OON services. By and large, OON services typically contribute between 9% and 15% of patient OOP costs. Higher rates of OON contributions to total patient OOP costs are more likely as time elapses. However, aggregate patient OOP costs decline over time, so the use of OON services has a smaller impact on total patient OOP costs.

Considerations for payers

While costs for blood cancer care accumulate to daunting levels over the three years after diagnosis, amounts and services vary over time. The average per patient per month (PPPM) allowed spending was less than $2,000 just two months prior to the diagnosis. Allowed spending spiked in the month of diagnosis (an average $28,838 PPPM), which was the most expensive month across all blood cancers. The spike was driven mostly by inpatient hospital stays but also by outpatient facility services. After three years following diagnosis, allowed spending PPPMs do not return to pre-cancer levels.

After diagnosis, anticancer drug therapies accounted for one-third of the total, and for some cancer types, such as chronic leukemia, these costs persisted over time. While therapies have increased both the cure and survival rates, increased survival is placing more pressure on payers to find efficiencies in care.

Insurance coverage offers substantial protection to the patients in our data. However, most services result in some OOP costs for the patient. The patient OOP burden varies over time, peaking in the month of diagnosis. These costs are largely driven by services billed by professionals and to a lesser extent by outpatient hospital services. While patient OOP costs decreased after diagnosis, the percentage of patient OOP costs attributed to professional services persisted over time.

Our results reflect the impact of today's benefit designs on patients with expensive conditions. We note four important factors affecting patients:

1. Plan design affects patient OOP costs, especially the annual deductibles. The patient is responsible for paying the annual deductible before a plan begins to cover expenses. The annual cycle of fulfilling the deductible causes the spikes in patient OOP spending each January. (See Figure 9 above.)
2. Patients enrolled in plans with high deductibles ($1,250 or higher for an individual in 2014, according to IRS rules) will incur higher patient OOP costs. Twenty-eight percent of our incident blood cancer patient population was enrolled in such a plan and these patients incurred OOP costs double that of patients enrolled in traditional plans. In particular, the largest differences in costs were found for services billed by professionals and outpatient facilities.
3. Plans levy higher patient cost sharing for services deemed out-of-network (OON) to incentivize patients to use preferred, in-network providers. The ACA's maximum allowed out-of-pocket limit ($6,350 per individual and $12,700 per family in 2014) is not required to cover OON spending. Our analysis found higher coinsurance and copay rates than for the same services in-network.
4. OON service contribution to total patient OOP costs varied over time, between 9% and 15%; 12% of patient OOP costs occur in the month of diagnosis. The bulk of the OON utilization and costs observed were incurred for services billed by professionals separately or independently of facility charges. Anticancer drug therapy reported a relatively lower contribution to patient OOP costs compared to other service categories. This is likely due to a lower effective cost sharing (a combination of fixed copays and coinsurance) and the fact that close to 100% of pharmacy spending is considered in-network.

These four patient financial issues are difficult challenges for insurers and employer-sponsored benefits. Insurance coverage does offer substantial protection to most of the patients in our data. However, some patients, especially those with high-deductible plans, will face financial toxicity.[21] Payers can ameliorate some of these issues by trying to provide prompt financial counseling to affected individuals. Avoiding OON charges can protect a patient's financial resources. Plan design changes could help smooth the calendar year deductible spike. But the ultimate solution is to reduce healthcare cost, and not to pass overly high costs to patients.

Limitations

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

- The results are based on analysis of the 2013-2016 Truven Health MarketScan® commercial database. Different data and time periods can produce different results. Individual patient experience will very likely differ from these population averages. Changes in treatment patterns and technology occurring after 2016 are not captured in the results.

- We observed patients for their duration in the database and did not attempt to identify deaths. It is possible people exiting these databases could bias the results.

- Regional and local care and spending vary significantly, so regional healthcare systems may exhibit patterns that vary from these national averages.

- The data utilized reflects a commercially insured population. We would expect that other populations with alternate benefit structures, such as Medicare, could show different patterns. For example, Medicare does not currently have caps on patient OOP costs for either medical or pharmacy benefits, although the deductible structure for hospital inpatient care offers significant patient protection as do patient OOP caps in Medicare Advantage plans.

- Patient OOP costs summarized in this report reflect the total responsibility of a patient's cost share as per individual plan designs. They do not reflect discounts on services such as coupons and rebates redeemed for these services.

Sources and Methodology

DATA

Truven Health Marketscan® commercial claims databases

Truven Health MarketScan® commercial data comes from an annual medical database that includes private sector health data from approximately 100 payers. The database contains claims from approximately 28 million commercially insured lives as of 2016 and is geographically diverse. Additional, this database consists of person-specific clinical utilization, expenditures, and enrollment across inpatient, outpatient, prescription drug, and carve-out services from a selection of large employer health plans and government and public organizations in the United States. The Truven Health MarketScan® commercial databases link paid claims and encounter data to detailed patient information across sites and types of providers, and over time. We used the years 2013 to 2016 for this analysis.

METHODOLOGY

Identification of 2016 prevalent blood cancer population

We identified patients who reported a blood cancer diagnosis in 2016. Cancer patients were excluded from the study if they met any of the following conditions:

- Missing date of birth or gender
- Not enrolled in a plan for at least one month as an active employee, early retiree, COBRA enrollee (or a dependent of one) in 2016
- Age 65 or older as of the end of 2016
- Did not report pharmacy coverage for every month of medical coverage in the year

Cancer patients were identified as individuals with cancer ICD-10 codes (provided in Appendix B) in any position on qualified claims, which are described in the table in Figure 14. Patients were required to have a cancer ICD-10 diagnosis code in any position on one inpatient, one observation, or one emergency room (ER) 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 14.

FIGURE 14: 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 2014 incident blood cancer population

For this analysis we identified patients with an initial cancer diagnosis in 2014. The date of service for the earliest identifying cancer claim in 2014 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 2014 claims and ICD-9 blood cancer diagnosis codes using a process similar but not identical to the 2016 analysis. Patients were required to have a cancer ICD-9 diagnosis code in any position on one inpatient, one observation, or one ER visit in 2014 or two or more non-acute inpatient or outpatient evaluation and management services that occurred within nine months of each other, where the first of which had to occur in 2014. 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 2014. This affected 4% of the patients identified in 2014. Qualified claims were identified by the CPT, HCPCS, or Revenue codes as reported in Figure 14 above.

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

- Missing date of birth or gender.
- Not enrolled in a plan with both medical and pharmacy coverage for 25 continuous months as an active employee, early retiree, or COBRA enrollee (or a dependent of one) from January 2013 through January 2015.
- Age 65 or older as of the end of 2016.
- Age 17 or younger as of the end of 2013.

- 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 D.
- 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 12 months of the index date. If the patient received a radiation oncology service or a direct anticancer drug treatment (refer to Appendix E), or if the patient were 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 if that person reported a cancer ICD-9 diagnosis code (see the table in Figure 15) in any position on one inpatient, observation, ER visit, outpatient, or non-acute inpatient evaluation and management claim.

FIGURE 15: ICD-9 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
200.xx-208.xx	Leukemias and lymphomas
209.0x-209.3x	Neuroendocrine tumors
230.xx-234.xx	Carcinoma in situ

Patients remained in the study through the earlier of their departure from the data or the end of 2016.

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 E 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.[22,23] (See Appendix E, Tables E16, E17, and E18.)
2. *Anticancer drug therapy*. Includes all claims lines associated with anticancer drug treatments (chemotherapy, immunotherapy, and other biologic agents) and supportive care including:

- Physician- and prescription-administered chemotherapy, immunotherapy, and biologic agents. (See Appendix E, Tables E1 and E3.)
- Inpatient admissions for chemotherapy Medicare Severity Diagnosis-Related Groups (MS-DRGs). (See Appendix E, Table E2.)
- Drug administration. (See Appendix E, Table E4.)
- Adjuvant therapy. (See Appendix E, Tables E6 and E7.)
- Hematopoietic agents. (See Appendix E, Tables E8 and E9.)
- Antiemetics:[24]
    - For office-administered antiemetics (see Appendix E, Table E10) and antiemetic claims lines when administered within one day of a physician-administered chemotherapy drug (see Appendix E, Table E1) or within 30 days of a fill of a chemotherapy prescription (see Appendix E, Table E3).
    - For pharmacy-administered antiemetics (see Appendix E, Table E11), antiemetic claims lines when prescription is filled from within 14 days before through seven days after a physician-administered chemotherapy service (see Appendix E, Table E1) or within 30 days of a fill of a chemotherapy prescription (see Appendix E, Table E3).

3. *Radiation oncology*. Includes claims reporting at least one radiation oncology treatment. (See Appendix E, Tables E12, E13, and E14.)
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.

Empirical identification of high-deductible plans

The Truven Health Marketscan® data provides a field GROUPID that identifies a unique plan. For each unique plan identified within the 2014 blood cancer patient population, we pulled the complete 2014 membership available in the data and summarized the total annual medical patient OOP costs paid toward the deductible for in-network services, broken out by subscriber and type of coverage (individual vs. family). Plans that reported a clear majority (greater than 85%) of individuals with an annual deductible spend of $1,250 or more and families with an annual deductible spend of $2,500 or more were identified as being high-deductible. The Kaiser Family Foundation reported that 20% of all covered workers in the United States were enrolled in a high-deductible plan with saving option in 2014.[25] We determined that 28% of blood cancer

patients in the study population were enrolled in a high-deductible plan in the year of diagnosis (2014).

Appendix A: Service Category Descriptions

<table>
<tr>
<td>Bone Marrow Transplant

All costs incurred within 30 days prior to 100 days following an inpatient or outpatient bone marrow transplant procedure.</td>
<td>Radiation Oncology

Outpatient facility and professional claims reporting a Revenue code of 0333 or a radiation oncology procedure code.</td>
</tr>
<tr>
<td>Anticancer Drug Therapy and Supportive Services

• Prescription-administered anticancer target drugs: Chemotherapy, immunotherapy, and biologic agents.
• Physician-administered anticancer target drugs: Chemotherapy, immunotherapy, and biologic agents.
• Professional chemotherapy administration.
• Inpatient facility admissions for chemotherapy.
• Hematopoietic agents.
• Chemotherapy adjuncts.
• Antiemetics.</td>
<td>Inpatient Facility

• Acute inpatient admissions excluding those billed under chemotherapy MS-DRGs.
  ○ 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
  ○ 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</td>
</tr>
<tr>
<td>Outpatient Facility

All non-chemotherapy and non-radiation oncology services billed by a hospital outpatient facility or ambulatory surgical center.
• 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.)</td>
<td>Professional Services

All non-chemotherapy and radiation oncology-related services billed by medical professionals
• 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</td>
</tr>
<tr>
<td colspan="2">Other Services

• Home Health
• Transportation
• Other Drugs and Administration
• Hospice
• Vision
• DMEPOS</td>
</tr>
</table>

Appendix B: Monthly Allowed Spending by Blood Cancer

FIGURE 16: ALLOWED SPENDING PER PATIENT PER MONTH FOR ACUTE LEUKEMIA PATIENTS BY TYPE OF SERVICE (2014-2016)

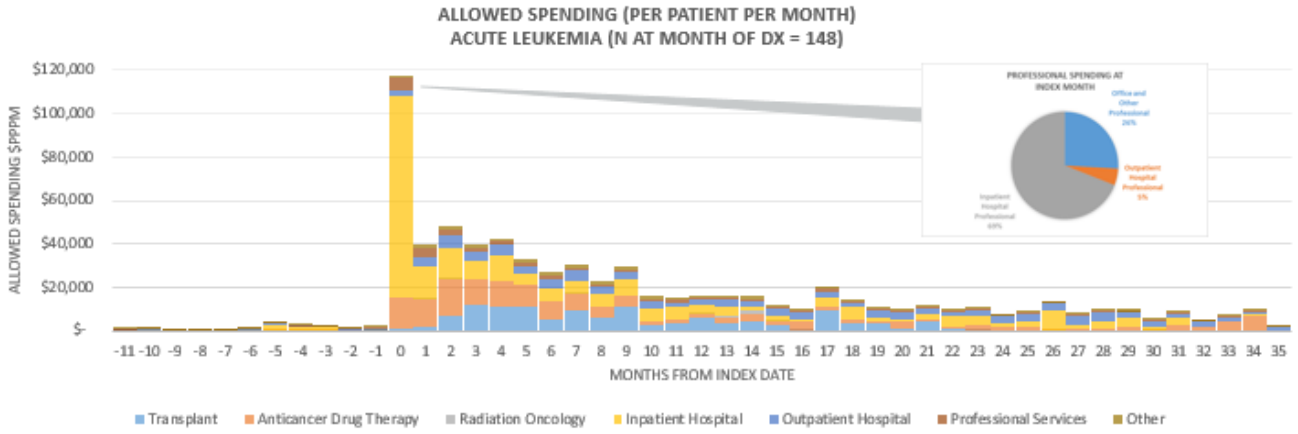


FIGURE 17: ALLOWED SPENDING PER PATIENT PER MONTH FOR CHRONIC LEUKEMIA PATIENTS BY TYPE OF SERVICE (2014-2016)

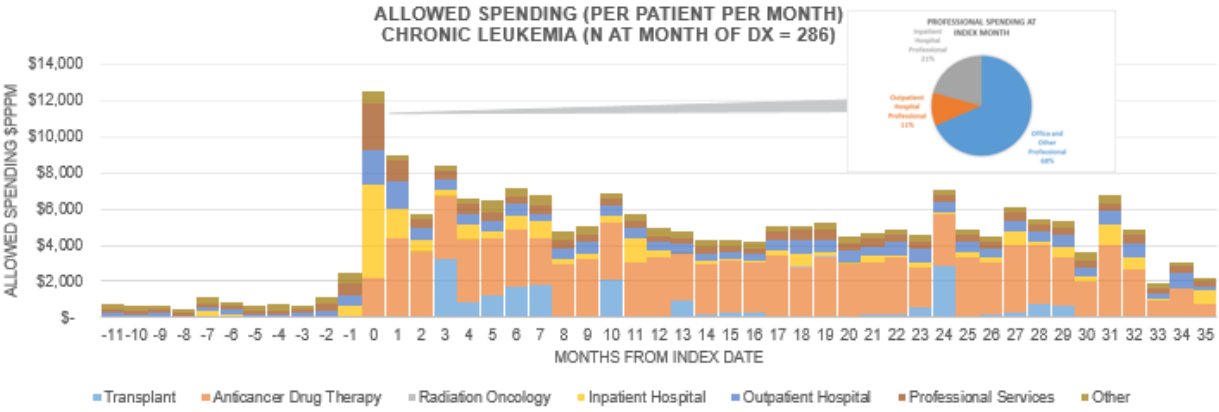


FIGURE 18: ALLOWED SPENDING PER PATIENT PER MONTH FOR LYMPHOMA PATIENTS BY TYPE OF SERVICE (2014-2016)

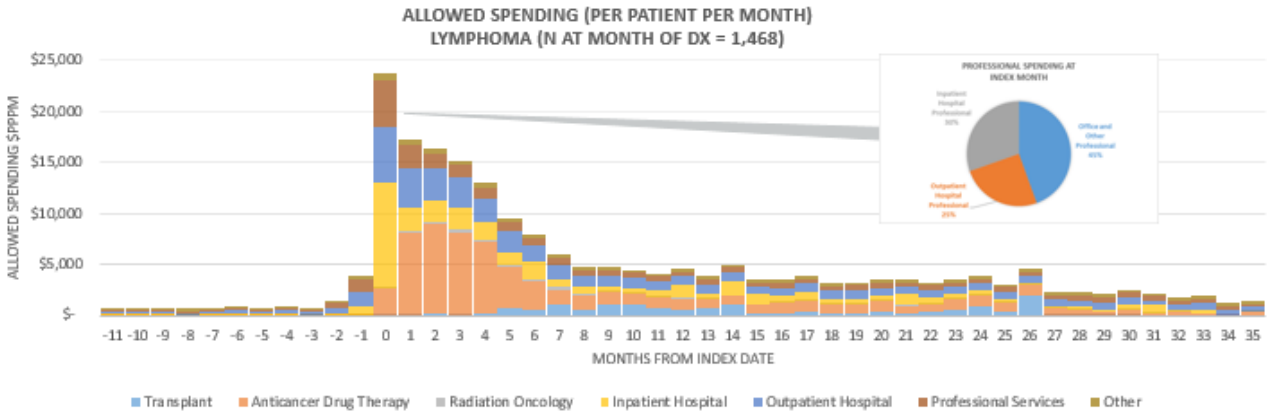


FIGURE 19: ALLOWED SPENDING PER PATIENT PER MONTH FOR MULTIPLE MYELOMA PATIENTS BY TYPE OF SERVICE (2014-2016)

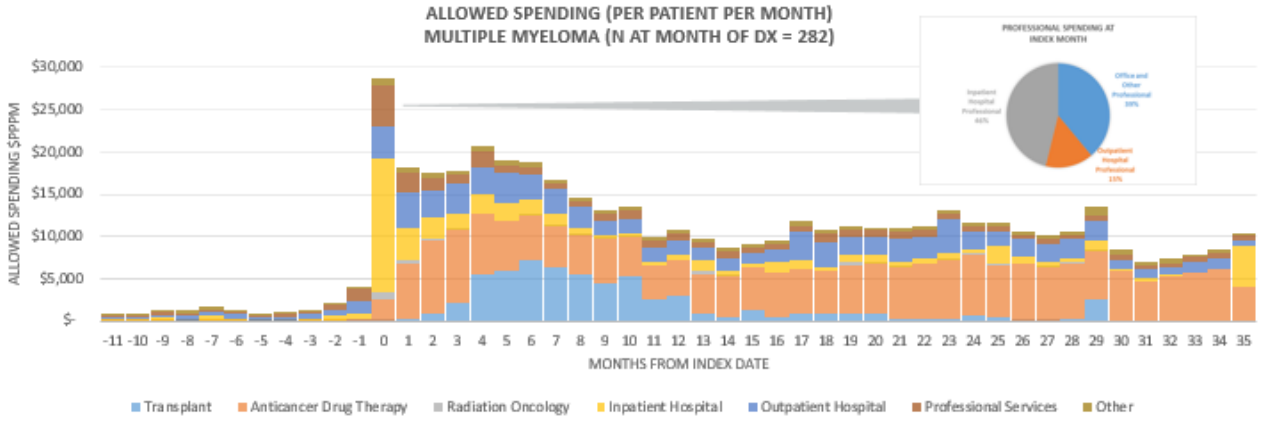
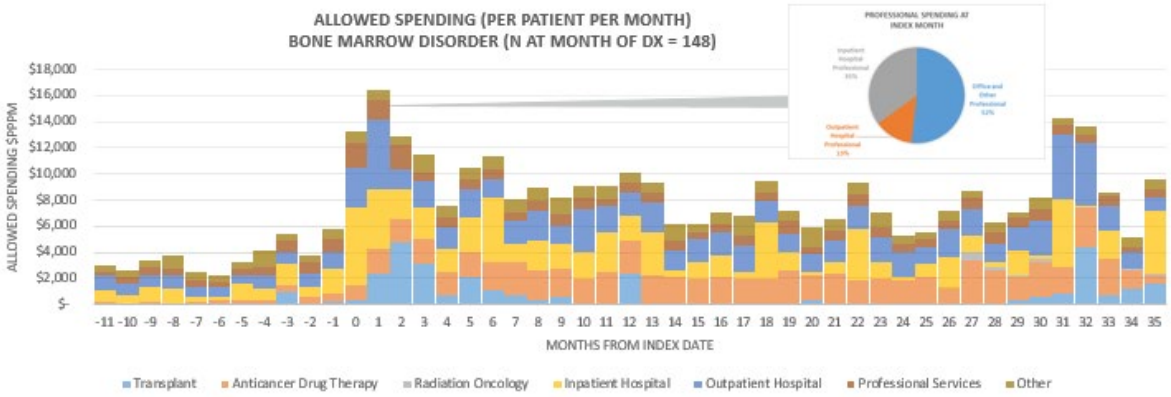


FIGURE 20: ALLOWED SPENDING PER PATIENT PER MONTH FOR BONE MARROW DISORDER PATIENTS BY TYPE OF SERVICE (2014-2016)



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

FIGURE 21: PATIENT OUT-OF-POCKET COSTS PER PATIENT PER MONTH FOR ACUTE LEUKEMIA PATIENTS BY TYPE OF SERVICE (2014-2016)

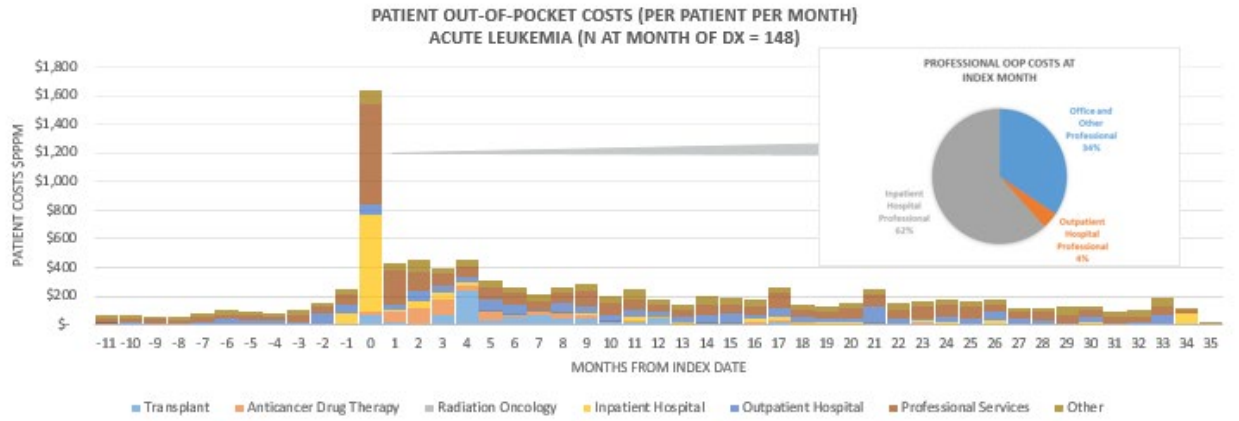


FIGURE 22: PATIENT OUT-OF-POCKET COSTS PER PATIENT PER MONTH FOR CHRONIC LEUKEMIA PATIENTS BY TYPE OF SERVICE (2014-2016)

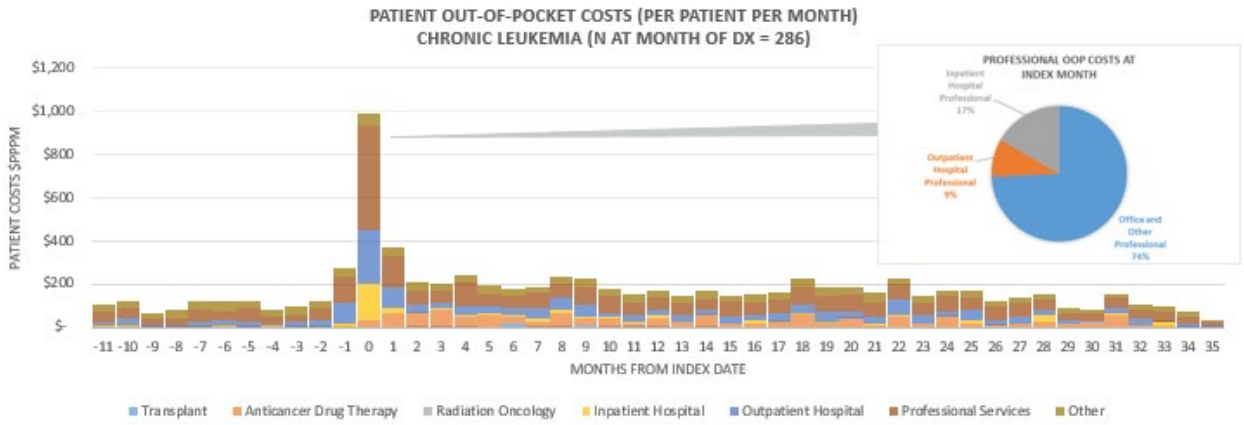


FIGURE 23: PATIENT OUT-OF-POCKET COSTS PER PATIENT PER MONTH FOR LYMPHOMA PATIENTS BY TYPE OF SERVICE (2014-2016)

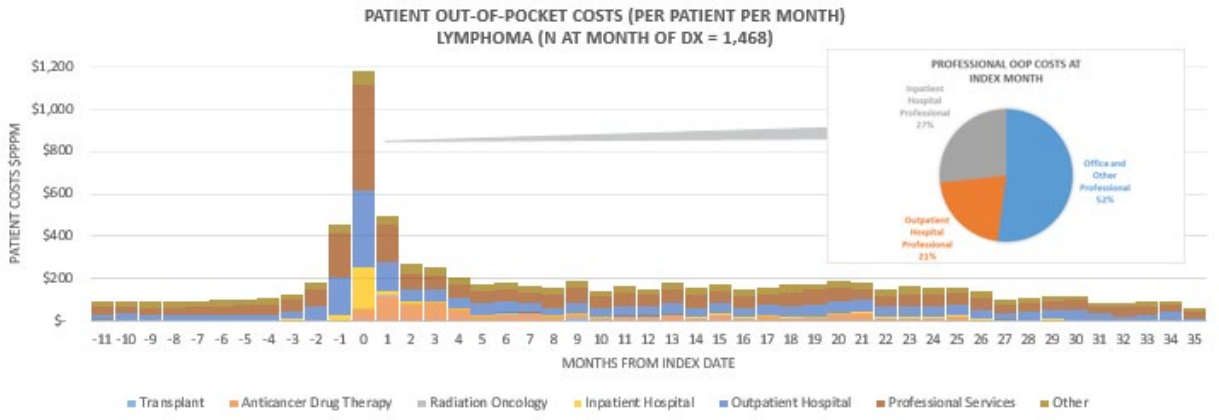


FIGURE 24: PATIENT OUT-OF-POCKET COSTS PER PATIENT PER MONTH FOR MULTIPLE MYELOMA PATIENTS BY TYPE OF SERVICE (2014-2016)

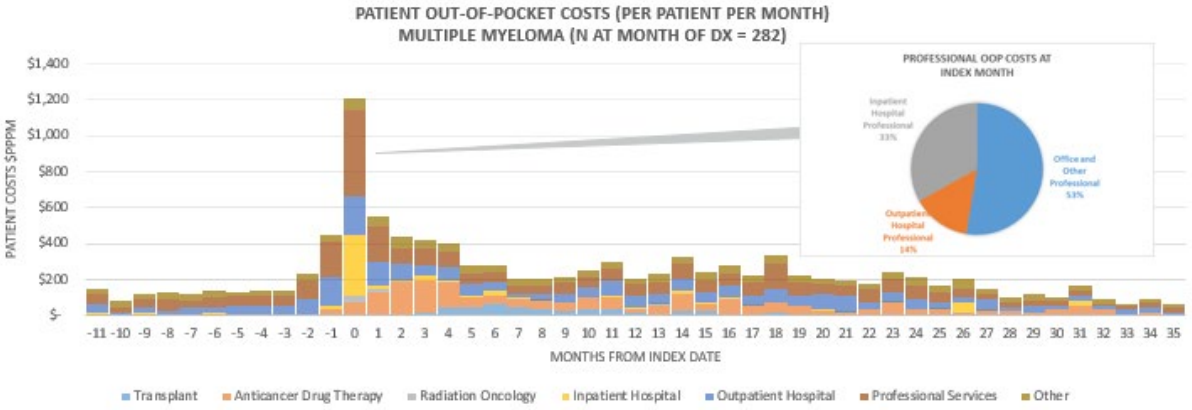
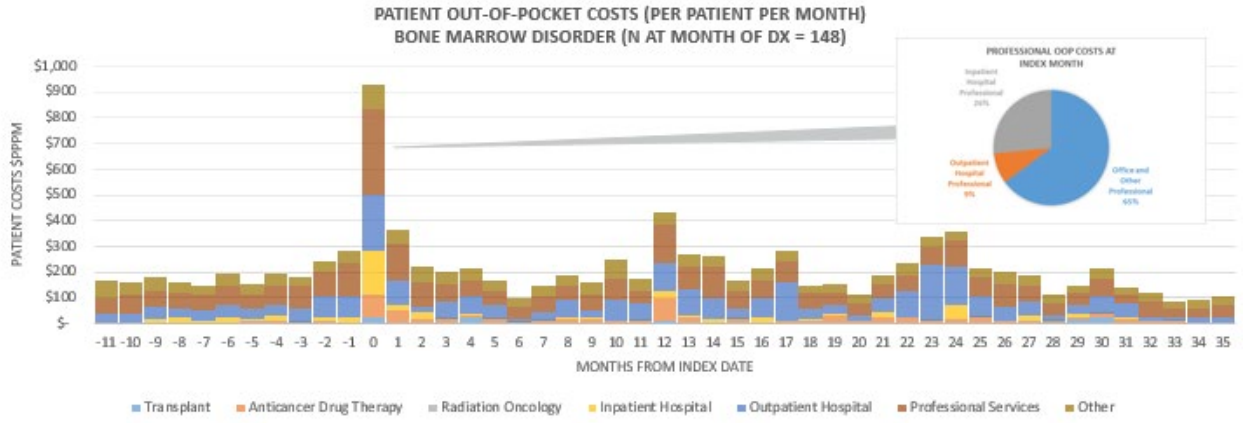


FIGURE 25: PATIENT OUT-OF-POCKET COSTS PER PATIENT PER MONTH FOR BONE MARROW DISORDER PATIENTS BY TYPE OF SERVICE (2014-2016)



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

D1: ICD-9 LEUKEMIA DIAGNOSIS CODES

ICD-9										
20400	20410	20420	20480	20490	20500	20510	20520	20530	20580	20590
20600	20610	20620	20680	20690	20700	20720	20780	20800	20810	20820
20880	20890									

D2: ICD-9 LEUKEMIA DIAGNOSIS CODES INDICATING RELAPSE OR REMISSION

ICD-9										
20401	20402	20411	20412	20421	20422	20481	20482	20491	20492	20501
20502	20511	20512	20521	20522	20531	20532	20581	20582	20591	20592
20601	20602	20611	20612	20621	20622	20681	20682	20691	20692	20701
20702	20721	20722	20781	20782	20801	20802	20811	20812	20821	20822
20881	20882	20891	20892							

D3: ICD-10 ACUTE LEUKEMIA DIAGNOSIS CODES

ICD-10										
C91.3x	C91.5x	C91.6x	C91.ax	C92.0x	C92.3x	C92.4x	C92.5x	C92.6x	C92.ax	C93.0x
C94.0x	C94.2x	C94.3x	C95.0x							

D4: ICD-10 CHRONIC LEUKEMIA DIAGNOSIS CODES

ICD-10			
C91.1x	C92.1x	C93.1x	C95.1x

D5: ICD-9 MULTIPLE MYELOMA DIAGNOSIS CODES

ICD-9	
20300	20310

D6: ICD-9 MULTIPLE MYELOMA DIAGNOSIS CODES INDICATING RELAPSE OR REMISSION

ICD-9				
20301	20302	20311	20312	20381

D7: ICD-10 MULTIPLE MYELOMA DIAGNOSIS CODES

ICD-10
C90.xx

D8: ICD-9 LYMPHOMA DIAGNOSIS CODES

ICD-9								
200.xx	201.xx	2020.x	2021.x	2022.x	2024.x	2027.x	2028.x	2733

D9: ICD-9 LYMPHOMA DIAGNOSIS CODES INDICATING RELAPSE OR REMISSION

ICD-9
20382

D10: ICD-10 LYMPHOMA DIAGNOSIS CODES

ICD-10						
C81.xx	C82.xx	C83.xx	C84.xx	C85.xx	C86.xx	C88.xx

D11: ICD-9 BONE MARROW DISORDER DIAGNOSIS CODES

ICD-9			
23872	23873	23874	23875

D12: ICD-9 BONE MARROW DISORDER DIAGNOSIS CODES

ICD-9		
C91.4x	C94.6x	D46.xx

Appendix E: Supporting Code Lists

E1: 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					

E2: 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

E3: PRESCRIPTION-ADMINISTERED ANTICANCER THERAPY DRUGS

Generic Drug Names			
Abiraterone	Ado-Trastuzumab Emtansine	Afatinib	Aldesleukin
Alectinib	Alemtuzumab	Altretamine	Anastrozole
Anti-Thymocyte Globulin, Rabbit	Arsenic Trioxide	Asparaginase	Atezolizumab
Axitinib	Azacitidine	Bcg Live Vax, Intravesical	Belinostat
Bendamustine	Bevacizumab	Bexarotene	Bicalutamide
Bleomycin	Blinatumaomab	Bortezomib	Bosutinib
Brentuximab Vedotin	Busulfan	Cabazitaxel	Cabozantinib
Capecitabine	Carboplatin	Carfilzomib	Carmustine
Ceritinib	Cetuximab	Chlorambucil	Cisplatin
Cladribine	Clofarabine	Cobimetinib	Crizotinib
Cyclophosphamide	Cytarabine	Dabrafenib	Dacarbazine
Dactinomycin	Daratumumab	Dasatinib	Daunorubicin
Daunorubicin, Liposomal	Decitabine	Degarelix	Denileukin Diftitox
Docetaxel	Doxorubicin	Elotuzumab	Enzalutamide
Epirubicin	Equine Thymocyte Immune Globulin	Eribulin	Erlotinib
Estramustine	Etoposide	Everolimus	Exemestane
Floxuridine	Fludarabine	Fluorouracil	Flutamide
Fulvestrant	Gefitinib	Gemcitabine	Goserelin
Histrelin	Hydroxyurea	Ibritumomab Tiuxetan	Ibrutinib
Idarubicin	Idelalisib	Ifosfamide	Imatinib
Interferon, Gamma 1-B	Ipilimumab	Irinotecan	Ironotecan
Ixabepilone	Ixazomib	Lanreotide	Lapatinib
Lenalidomide	Lenvatinib	Letrozole	Leuprolide
Leuprolide And Norethindrone	Lomustine	Mechlorethamine	Melphalan
Mercaptopurine	Methotrexate Sodium	Mitomycin	Mitotane
Mitoxantrone	Necitumumab	Nelarabine	Nilotinib
Nilutamide	Nivolumab	Obinutuzumab	Ofatumumab
Olaparib	Omacetaxine	Omacetaxine Mepesuccinate	Osimertinib
Oxaliplatin	Paclitaxel	Palbociclib	Panitumumab
Panobinostat	Pazopanb	Pegaspargase	Pembrolizumab
Pemetrexed	Pentostatin	Pertuzumab	Pomalidomide
Ponatinib	Pralatrexate	Procarbazine	Ramucirumab
Regorafenib	Rituximab	Romidepsin	Rucaparib
Ruxolitinib Phosphate	Siltuximab	Sipuleucel-T	Sonidegib
Sorafenib	Streptozocin	Sunitinib	Talimogene Laherparepvec
Tamoxifen	Temozolomide	Temsirolimus	Teniposide
Thalidomide	Thioguanine	Thiotepa	Topotecan
Toremifene	Tositumomab	Trabectedin	Trametinib
Trastuzumab	Trifluridine/ Tipiracil	Triptorelin	Valrubicin
Vandetanib	Vemurafenib	Venetoclax	Vinblastine
Vincristine	Vinorelbine	Vismodegib	Vorinostat
Ziv-Aflibercept			

E4: 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										

E5: ANTICANCER DRUG THERAPY ADMINISTRATION, REVENUE CODES

Revenue Codes		
331	332	335

E6: ADJUVANT THERAPY

HCPCS							
J1190	J9209	J2783	J0640	J0207	J2425	J0641	C9293

E7: PRESCRIPTION-ADMINISTERED ADJUVANT THERAPY DRUGS

Generic Drug Names			
Allopurinol	Allopurinol Sodium	Amifostine	Amifostine Crystalline
Dexrazoxane	Glucarpidase	Ifosfamide & Mesna	Lesinurad-Allopurinol
Leucovorin Calcium	Levoleucovorin Calcium	Mesna	Palifermin
Rasburicase			

E8: PHYSICIAN-ADMINISTERED HEMATOPOIETIC AGENTS, HCPCS

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

E9: PRESCRIPTION-ADMINISTERED HEMATOPOIETIC AGENT DRUGS

Generic Drug Names			
Aranesp	Epogen	Granix	Leukine
Mircera	Neulasta	Neumega	Neupogen
Nplate	Omontys	Procrit	Promacta
Zarxio			

E10: 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						

E11: PRESCRIPTION-ADMINISTERED ANTIEMITIC DRUGS

Generic Drug Names		
Alprazolam	Aprepitant	Benztropine Mesylate
Chlorcyclizine HCl	Chlorpromazine HCl	Cyclizine HCl
Dexamethasone	Dexamethasone Acetate	Dexamethasone Acetate & Sodium Phosphate
Dexamethasone Sodium Phosphate	Dimenhydrinate	Diphenhydramine Citrate
Diphenhydramine HCl	Diphenhydramine Tannate	Dolasetron Mesylate
Dronabinol	Droperidol	Fosaprepitant Dimeglumine
Granisetron	Granisetron HCl	Haloperidol
Haloperidol Decanoate	Haloperidol Lactate	Hydroxyzine HCl
Hydroxyzine Pamoate	Lorazepam Tab	Lorazepam-Dextrose
Lorazepam-Sodium Chloride	Meclizine HCl	Methylprednisolone
Methylprednisolone Acetate	Methylprednisolone Sodium Succinate	Metoclopramide HCl
Midazolam	Midazolam HCl	Nabilone
Netupitant-Palonosetron	Olanzapine	Olanzapine Pamoate
Ondansetron	Ondansetron HCl	Ondansetron HCl and Dextrose
Ondansetron HCl and Sodium Chloride	Palonosetron HCl	Perphenazine
Prochlorperazine	Prochlorperazine Maleate	Prochlorperazine.
Promethazine HCl	Rolapitant HCl	Scopolamine TD
Trimethobenzamide HCl	Trimethobenzamide-Benzocaine	

E12: 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				

E13: RADIATION ONCOLOGY ICD-9 PROCEDURE CODES

ICD-9										
1426	9220	9221	9222	9223	9224	9225	9226	9228	9229	9230
9231	9232	9233	9239							

E14: RADIATION ONCOLOGY ICD-10 PROCEDURE CODES

ICD10									
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	D0006ZZ	D0010ZZ	D0011ZZ	D0012ZZ	D0013ZZ	D0014ZZ	D0015ZZ
D0016ZZ	D0060ZZ	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	D7001ZZ	D7002ZZ	D7003ZZ	D7004ZZ
D7005ZZ	D7006ZZ	D7010ZZ	D7011ZZ	D7012ZZ	D7013ZZ	D7014ZZ	D7015ZZ	D7016ZZ	D7020ZZ
D7021ZZ	D7022ZZ	D7023ZZ	D7024ZZ	D7025ZZ	D7026ZZ	D7030ZZ	D7031ZZ	D7032ZZ	D7033ZZ
D7034ZZ	D7035ZZ	D7036ZZ	D7040ZZ	D7041ZZ	D7042ZZ	D7043ZZ	D7044ZZ	D7045ZZ	D7046ZZ
D7050ZZ	D7051ZZ	D7052ZZ	D7053ZZ	D7054ZZ	D7055ZZ	D7056ZZ	D7060ZZ	D7061ZZ	D7062ZZ
D7063ZZ	D7064ZZ	D7065ZZ	D7066ZZ	D7070ZZ	D7071ZZ	D7072ZZ	D7073ZZ	D7074ZZ	D7075ZZ
D7076ZZ	D7080ZZ	D7081ZZ	D7082ZZ	D7083ZZ	D7084ZZ	D7085ZZ	D7086ZZ	D71097Z	D71098Z
D71099Z	D7109BZ	D7109CZ	D7109YZ	D71197Z	D71198Z	D71199Z	D7119BZ	D7119CZ	D7119YZ
D71297Z	D71298Z	D71299Z	D7129BZ	D7129CZ	D7129YZ	D71397Z	D71398Z	D71399Z	D7139BZ
D7139CZ	D7139YZ	D71497Z	D71498Z	D71499Z	D7149BZ	D7149CZ	D7149YZ	D71597Z	D71598Z
D71599Z	D7159BZ	D7159CZ	D7159YZ	D71697Z	D71698Z	D71699Z	D7169BZ	D7169CZ	D7169YZ
D71797Z	D71798Z	D71799Z	D7179BZ	D7179CZ	D7179YZ	D71897Z	D71898Z	D71899Z	D7189BZ
D7189CZ	D7189YZ	D720DZZ	D720HZZ	D720JZZ	D721DZZ	D721HZZ	D721JZZ	D722DZZ	D722HZZ
D722JZZ	D723DZZ	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	D8109BZ
D8109CZ	D8109YZ	D820DZZ	D820HZZ	D820JZZ	D8Y07ZZ	D9000ZZ	D9001ZZ	D9002ZZ	D9003ZZ
D9004ZZ	D9005ZZ	D9006ZZ	D9010ZZ	D9011ZZ	D9012ZZ	D9013ZZ	D9014ZZ	D9015ZZ	D9016ZZ
D9030ZZ	D9031ZZ	D9032ZZ	D9033ZZ	D9034ZZ	D9035ZZ	D9036ZZ	D9040ZZ	D9041ZZ	D9042ZZ
D9043ZZ	D9044ZZ	D9045ZZ	D9046ZZ	D9050ZZ	D9051ZZ	D9052ZZ	D9053ZZ	D9054ZZ	D9055ZZ
D9056ZZ	D9060ZZ	D9061ZZ	D9062ZZ	D9063ZZ	D9064ZZ	D9065ZZ	D9066ZZ	D9070ZZ	D9071ZZ
D9072ZZ	D9073ZZ	D9074ZZ	D9075ZZ	D9076ZZ	D9080ZZ	D9081ZZ	D9082ZZ	D9083ZZ	D9084ZZ
D9085ZZ	D9086ZZ	D9090ZZ	D9091ZZ	D9092ZZ	D9093ZZ	D9094ZZ	D9095ZZ	D9096ZZ	D90B0ZZ
D90B1ZZ	D90B2ZZ	D90B3ZZ	D90B4ZZ	D90B5ZZ	D90B6ZZ	D90D0ZZ	D90D1ZZ	D90D2ZZ	D90D3ZZ
D90D4ZZ	D90D5ZZ	D90D6ZZ	D90F0ZZ	D90F1ZZ	D90F2ZZ	D90F3ZZ	D90F4ZZ	D90F5ZZ	D90F6ZZ
D91097Z	D91098Z	D91099Z	D9109BZ	D9109CZ	D9109YZ	D91197Z	D91198Z	D91199Z	D9119BZ
D9119CZ	D9119YZ	D91397Z	D91398Z	D91399Z	D9139BZ	D9139CZ	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	D91899Z	D9189BZ	D9189CZ	D9189YZ	D91997Z	D91998Z
D91999Z	D9199BZ	D9199CZ	D9199YZ	D91B97Z	D91B98Z	D91B99Z	D91B9BZ	D91B9CZ	D91B9YZ
D91D97Z	D91D98Z	D91D99Z	D91D9BZ	D91D9CZ	D91D9YZ	D91F97Z	D91F98Z	D91F99Z	D91F9BZ

E14: RADIATION ONCOLOGY ICD-10 PROCEDURE CODES – CONTINUED

ICD-10									
D91F9CZ	D91F9YZ	D920DZZ	D920HZZ	D920JZZ	D921DZZ	D921HZZ	D921JZZ	D924DZZ	D924HZZ
D924JZZ	D925DZZ	D925HZZ	D925JZZ	D926DZZ	D926HZZ	D926JZZ	D927DZZ	D927HZZ	D927JZZ
D928DZZ	D928HZZ	D928JZZ	D929DZZ	D929HZZ	D929JZZ	D92BDZZ	D92BHZZ	D92BJZZ	D92CDZZ
D92CHZZ	D92CJZZ	D92DDZZ	D92DHZZ	D92DJZZ	D9Y07ZZ	D9Y17ZZ	D9Y37ZZ	D9Y47ZZ	D9Y57ZZ
D9Y67ZZ	D9Y77ZZ	D9Y87ZZ	D9Y97ZZ	D9YB7ZZ	D9YD7ZZ	D9YF7ZZ	DB000ZZ	DB001ZZ	DB002ZZ
DB003ZZ	DB004ZZ	DB005ZZ	DB006ZZ	DB010ZZ	DB011ZZ	DB012ZZ	DB013ZZ	DB014ZZ	DB015ZZ
DB016ZZ	DB020ZZ	DB021ZZ	DB022ZZ	DB023ZZ	DB024ZZ	DB025ZZ	DB026ZZ	DB050ZZ	DB051ZZ
DB052ZZ	DB053ZZ	DB054ZZ	DB055ZZ	DB056ZZ	DB060ZZ	DB061ZZ	DB062ZZ	DB063ZZ	DB064ZZ
DB065ZZ	DB066ZZ	DB070ZZ	DB071ZZ	DB072ZZ	DB073ZZ	DB074ZZ	DB075ZZ	DB076ZZ	DB080ZZ
DB081ZZ	DB082ZZ	DB083ZZ	DB084ZZ	DB085ZZ	DB086ZZ	DB1097Z	DB1098Z	DB1099Z	DB109BZ
DB109CZ	DB109YZ	DB1197Z	DB1198Z	DB1199Z	DB119BZ	DB119CZ	DB119YZ	DB1297Z	DB1298Z
DB1299Z	DB129BZ	DB129CZ	DB129YZ	DB1597Z	DB1598Z	DB1599Z	DB159BZ	DB159CZ	DB159YZ
DB1697Z	DB1698Z	DB1699Z	DB169BZ	DB169CZ	DB169YZ	DB1797Z	DB1798Z	DB1799Z	DB179BZ
DB179CZ	DB179YZ	DB1897Z	DB1898Z	DB1899Z	DB189BZ	DB189CZ	DB189YZ	DB20DZZ	DB20HZZ
DB20JZZ	DB21DZZ	DB21HZZ	DB21JZZ	DB22DZZ	DB22HZZ	DB22JZZ	DB25DZZ	DB25HZZ	DB25JZZ
DB26DZZ	DB26HZZ	DB26JZZ	DB27DZZ	DB27HZZ	DB27JZZ	DB28DZZ	DB28HZZ	DB28JZZ	DBY07ZZ
DBY17ZZ	DBY27ZZ	DBY57ZZ	DBY67ZZ	DBY77ZZ	DBY87ZZ	DD000ZZ	DD001ZZ	DD002ZZ	DD003ZZ
DD004ZZ	DD005ZZ	DD006ZZ	DD010ZZ	DD011ZZ	DD012ZZ	DD013ZZ	DD014ZZ	DD015ZZ	DD016ZZ
DD020ZZ	DD021ZZ	DD022ZZ	DD023ZZ	DD024ZZ	DD025ZZ	DD026ZZ	DD030ZZ	DD031ZZ	DD032ZZ
DD033ZZ	DD034ZZ	DD035ZZ	DD036ZZ	DD040ZZ	DD041ZZ	DD042ZZ	DD043ZZ	DD044ZZ	DD045ZZ
DD046ZZ	DD050ZZ	DD051ZZ	DD052ZZ	DD053ZZ	DD054ZZ	DD055ZZ	DD056ZZ	DD070ZZ	DD071ZZ
DD072ZZ	DD073ZZ	DD074ZZ	DD075ZZ	DD076ZZ	DD1097Z	DD1098Z	DD1099Z	DD109BZ	DD109CZ
DD109YZ	DD1197Z	DD1198Z	DD1199Z	DD119BZ	DD119CZ	DD119YZ	DD1297Z	DD1298Z	DD1299Z
DD129BZ	DD129CZ	DD129YZ	DD1397Z	DD1398Z	DD1399Z	DD139BZ	DD139CZ	DD139YZ	DD1497Z
DD1498Z	DD1499Z	DD149BZ	DD149CZ	DD149YZ	DD1597Z	DD1598Z	DD1599Z	DD159BZ	DD159CZ
DD159YZ	DD1797Z	DD1798Z	DD1799Z	DD179BZ	DD179CZ	DD179YZ	DD20DZZ	DD20HZZ	DD20JZZ
DD21DZZ	DD21HZZ	DD21JZZ	DD22DZZ	DD22HZZ	DD22JZZ	DD23DZZ	DD23HZZ	DD23JZZ	DD24DZZ
DD24HZZ	DD24JZZ	DD25DZZ	DD25HZZ	DD25JZZ	DD27DZZ	DD27HZZ	DD27JZZ	DDY07ZZ	DDY17ZZ
DDY27ZZ	DDY37ZZ	DDY47ZZ	DDY57ZZ	DDY77ZZ	DF000ZZ	DF001ZZ	DF002ZZ	DF003ZZ	DF004ZZ
DF005ZZ	DF006ZZ	DF010ZZ	DF011ZZ	DF012ZZ	DF013ZZ	DF014ZZ	DF015ZZ	DF016ZZ	DF020ZZ
DF021ZZ	DF022ZZ	DF023ZZ	DF024ZZ	DF025ZZ	DF026ZZ	DF030ZZ	DF031ZZ	DF032ZZ	DF033ZZ
DF034ZZ	DF035ZZ	DF036ZZ	DF1097Z	DF1098Z	DF1099Z	DF109BZ	DF109CZ	DF109YZ	DF1197Z
DF1198Z	DF1199Z	DF119BZ	DF119CZ	DF119YZ	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

E14: RADIATION ONCOLOGY ICD-10 PROCEDURE CODES – CONTINUED

ICD-10									
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									

E15: TRANSPLANT, HCPCS

HCPCS	
38240	38241

E16: 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

E17: TRANSPLANT ICD-9 PROCEDURE CODES

ICD-9									
4100	4101	4102	4103	4104	4105	4106	4107	4108	4109

E18: 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

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