CENTERS FOR MEDICARE & MEDICAID SERVICES
OFFICE OF MINORITY HEALTH

Opioid Prescription in Medicare Beneficiaries: Prescription Opioid Policies and Implications for Beneficiaries with Sickle Cell Disease

JUNE 19, 2019

PRESENTED TO:

Shondelle Wilson-Frederick
OMH/CMS

Centers for Medicare and Medicaid Services
7500 Security Boulevard
Baltimore, MD 21244

PRESENTED BY:

The National Committee for Quality Assurance (NCQA)
1100 13th Street NW, Third Floor
Washington, DC 20005

Opioid Prescription in Medicare Beneficiaries: Prescription Opioid Policies and Implications for Beneficiaries with Sickle Cell Disease

Submitted to:
Centers for Medicare & Medicaid Services
Office of Minority Health

Project Director: Cara James, Director

CMS & Additional Staff: Shondelle Wilson-Frederick, CMS
Nelvis Njei, CMS
Mary Hulihan, CDC
Michelle Oswald, CMS
Meagan Khau, CMS
Michelle Ketcham, CMS
Beckie Peyton, CMS
Lisa Thorpe, CMS

Submitted by:
National Committee for Quality Assurance
1100 13th St. NW, Third Floor
Washington, DC 20005
Telephone: (202) 955-3500
Facsimile: (202) 955-3599

Project Director: Sarah Hudson Scholle, Vice President

NCQA Staff: Judy Ng, Research Scientist
Serene Olin, Assistant Vice President
Jacquee Blaz, Data Scientist II
Lauren Niles, Senior Health Care Analyst
Ronke Oyebode, Health Care Analyst

Suggested citation: CMS Office of Minority Health. Opioid Prescription in Medicare Beneficiaries: Prescription Opioid Policies and Implications for Beneficiaries with Sickle Cell Disease. Baltimore, MD: Centers for Medicare & Medicaid Services; June 2019.

Paid for by the U.S. Department of Health and Human Services.

Table of Contents

EXECUTIVE SUMMARY

Opioid misuse and abuse is a serious and challenging public health problem. Federal, state and local initiatives are underway to implement opioid-related policies to combat prescription opioid misuse and abuse, including among Medicare beneficiaries. In 2018, CMS redoubled its multiple efforts to address the opioid epidemic, including adopting new policies and updating existing ones to curb inappropriate opioid utilization.

New opioid policies in the Medicare Part D program in 2019 include drug management programs (DMPs) for beneficiaries determined to be at risk for misuse or abuse of opioids or other frequently abused drugs (currently designated as opioids and benzodiazepines for purposes of DMPs), and improved safety edits when opioid prescriptions are dispensed at the pharmacy.[1] Under DMPs, beneficiaries receiving high levels of opioids from multiple opioid prescribers and pharmacies are identified retrospectively, and plan sponsors perform case management with the beneficiaries' prescribers to promote safe use of opioids and benzodiazepines through care coordination.

Beneficiaries who are being treated for active cancer-related pain, have elected to receive hospice care or are receiving non-hospice palliative or end-of-life care, or are a resident of a long-term facility are exempted from DMPs. This policy recognizes that the appropriate use of opioids in managing such beneficiaries' pain is more likely to be inappropriately identified for DMPs. Currently, other vulnerable populations that also appropriately use opioids for pain management, such as beneficiaries living with sickle cell disease (SCD), are not exempted. However, CMS does recommend that beneficiaries with SCD be excluded from the real-time opioid safety edits, as well as beneficiaries with cancer, in hospice, receiving palliative or end-of-life care, or in a long-term care facility.

Objective of Report

To help inform future policy decisions related to opioid use and their applicability to beneficiaries with SCD, this report compares opioid utilization patterns among Medicare Fee-for-Service (FFS) beneficiaries with SCD to two already-exempted populations with complex pain syndromes: non-SCD beneficiaries with cancer and non-SCD beneficiaries in hospice care. For context, results for the general FFS population are also provided. Specifically, the report provides a comparison of beneficiaries in these three populations who use opioids at doses that are equal to or exceed an average daily morphine milligram equivalent (MME) of 120, the MME threshold that aligns with Pharmacy Quality Alliance opioid measures in effect in 2016 during the study's measurement period, and that defined "high dose opioid use" as daily use exceeding 120 MME.

---

[1] Part D drug management programs are codified in the CY 2019 Final Rule. https://www.gpo.gov/fdsys/pkg/FR-2018-04-16/pdf/2018-07179.pdf.
Improved Part D opioid safety alerts were announced in the 2019 Medicare Parts C&D Final Call Letter. https://www.cms.gov/Medicare/HealthPlans/MedicareAdvtgSpecRateStats/Announcements-and-Documents.html

Key Findings

- Among Medicare FFS beneficiaries, 0.1% had SCD, 18.0% had cancer, and 6.3% were in hospice care in 2016.

- Compared to beneficiaries with cancer or in hospice, beneficiaries with SCD were younger (mean age: 42.7 years), predominantly Black/African American (91.0%), more likely to qualify for Medicare based on a disability (89.9%), and more likely to reside in metropolitan areas (88.1%).

- Compared to beneficiaries with cancer or in hospice, beneficiaries with SCD had both higher inpatient admissions (55.3%) and emergency department visits (77.1%).

- 80.4% of beneficiaries with SCD had at least one prescription opioid fill compared to 39.2% for beneficiaries with cancer and 65.7% for beneficiaries in hospice.

    - Among the subset of beneficiaries who filled at least one opioid prescription, prescriptions for average daily MME ≥ 120 were highest among beneficiaries with SCD (29.8%) compared to beneficiaries with cancer (4.4%) and in hospice (7.4%).

- Beneficiaries with SCD filled a total of 65,845 30-day normed[2] opioid prescriptions in 2016, of which 59.9% (39,417 fills) were by beneficiaries with average daily MME ≥ 120. In 2016, beneficiaries with cancer filled a total of 3,884,659 30-day normed opioid prescriptions, of which only 22.4% (871,873 fills) were by those with average daily MME ≥ 120; beneficiaries in hospice filled a total of 3,269,799 30-day normed opioid prescriptions, of which only 22.7% (742,610 fills) were by those with average daily MME ≥ 120.

- Beneficiaries with SCD were the only beneficiary group to have a median days supply per fill less than 30 days.

- Although beneficiaries with SCD filled more opioid prescriptions with the average daily MME ≥ 120 than beneficiaries with cancer and in hospice, 51.6% of fills for beneficiaries with SCD were for 21 days or more, compared to 59.9% of fills for beneficiaries with cancer and 60.9% of fills for beneficiaries in hospice.

Conclusion

Our study suggests that the appropriate treatment of beneficiaries with SCD may involve patterns that may cause them to be inappropriately identified for DMPs. For example, although beneficiaries with SCD comprise a smaller share of the Medicare FFS population, they are more likely to have an opioid

[2] Prescriptions are normed to a 30-day supply by dividing the days duration by 30.

prescription and more likely to have a prescription with an average daily MME ≥ 120 compared to beneficiaries with cancer or in hospice care.

In April 2019, CDC released guidance that advised against the misapplication of the *Guideline for Prescribing Opioids for Chronic Pain* (CDC, 2018b; Dowell, Haegerich, & Chou, 2019). Cited examples of misapplication included applying the Guideline to patients in active cancer treatment, patients experiencing acute sickle cell crises, or patients experiencing post-surgical pain. Opioid policies may have the potential to impair access to an important treatment option - opioids - for beneficiaries with SCD. While CMS recommends that SCD patients be excluded from some Medicare Part D opioid policies, such as the opioid safety edits, SCD patients are not exempt from DMPs. The result of inclusion in DMPs could be that the benefits of case management are outweighed by the risks that beneficiaries with SCD could face, including challenges in timely access to prescribed opioids, potentially worse quality of care and health-related quality of life, and greater risk of adverse outcomes related to poor pain management. The findings suggest that beneficiaries with SCD should be exempt from DMPs. Also, as further efforts are made to reduce opioid misuse and overutilization, consideration should be given to exempting beneficiaries with SCD. Finally, additional study should be undertaken to understand the impact of current policies on access to pain management for beneficiaries with SCD.

INTRODUCTION

Opioid misuse and abuse is a serious and challenging public health problem. Federal, state and local initiatives are underway to implement policies to combat prescription opioid misuse and abuse, including among Medicare beneficiaries (U.S. OIG, 2017; U.S. OIG, 2016; U.S. OIG, 2015). In 2018, CMS redoubled its multiple efforts to address the opioid epidemic, including adopting new policies and updating existing ones to curb inappropriate opioid utilization (CMS Press, 2018a; CMS Press, 2018b).

New opioid policies in the Medicare Part D program in 2019 include drug management programs (DMPs) for beneficiaries determined to be at risk for misuse or abuse of opioids or other frequently abused drugs (currently designated as opioids and benzodiazepines for purposes of DMPs), and improved safety edits when opioid prescriptions are dispensed at the pharmacy.[3] Under DMPs, beneficiaries receiving high levels of opioids from multiple opioid prescribers and pharmacies are identified retrospectively, and plan sponsors perform case management with the beneficiaries' prescribers to promote safe use of opioids and benzodiazepines through care coordination.

Beneficiaries who are being treated for active cancer-related pain, have elected to receive hospice care or are receiving non-hospice palliative or end-of-life care, or are a resident of a long-term facility are exempted from DMPs. This policy recognizes that the appropriate use of opioids in managing such beneficiaries' pain is more likely to be inappropriately identified for DMPs. Currently, other vulnerable populations that also appropriately use opioids for pain management, such as beneficiaries living with sickle cell disease (SCD), are not exempted. However, CMS does recommend that beneficiaries with SCD be excluded from the real-time opioid safety edits, as well as beneficiaries with cancer, in hospice, receiving palliative or end-of-life care, or in a long-term care facility.

Pain management and the use of opioids in SCD

SCD is the most prevalent inherited blood disorder in the United States (National Human Genome Research Institute, 2016). An estimated 100,000 people in the U.S. live with SCD, and there is disproportionate representation among Blacks/African Americans and Hispanics (Hassell, 2010). A hallmark of SCD is vaso-occlusive crisis, characterized by pain of variable frequency and severity.

Acute pain management is central to the care of individuals with SCD, but is poorly managed across all health care settings (NIH National Heart, Lung, and Blood Institute, 2014). The pain burden in SCD also exacts a high medical cost. Among those with SCD, pain crisis is associated with emergency department

[3] Part D drug management programs are codified in the CY 2019 Final Rule. https://www.gpo.gov/fdsys/pkg/FR-2018-04-16/pdf/2018-07179.pdf.
Improved Part D opioid safety alerts were announced in the 2019 Medicare Parts C&D Final Call Letter. https://www.cms.gov/Medicare/HealthPlans/MedicareAdvtgSpecRateStats/Announcements-and-Documents.html

(ED) visits, hospitalizations, and approximately $2.4 billion in annual health care costs in the U.S. (Brousseau, Owens, Mosso, Panepinto, & Steiner, 2010; Elander, Lusher, Bevan, Telfer, & Burton, 2004; Lanzkron, Carroll, & Haywood, 2010).

Opioid analgesics are an important treatment option for managing pain in SCD. However, there are challenges to providing optimal pain management for those with SCD:

- There is limited evidence to guide opioid administration (NICE, 2012; Yawn & John-Sowah, 2015) and managing recurrent SCD pain crises can require higher doses of opioid prescriptions,

- The management of SCD acute and chronic pain symptoms may be challenging, since SCD affects multiple organs and body systems, and causes pain not always associated with clearly visible or objective physical signs,

- Generally, there is limited knowledge of SCD among providers, and this may result in misperceptions of SCD patients as malingering, or as drug abusers or addicts (Elander et al., 2004; Ruta & Ballas, 2016),

- There are patient misconceptions and fears about the side effects of existing therapeutic options (NIH National Heart, Lung, and Blood Institute, 2014).

Opioid epidemic and its impact on SCD treatment

The complex nature of pain management for people living with SCD is compounded by the ongoing opioid crisis. Policies to curb the opioid epidemic have the potential to impair access to an important treatment option for SCD pain (Dowell, Haegerich, & Chou, 2016; Murthy, 2016; AMA, 2017). Prior work attempting to shed light on opioid utilization in Medicare beneficiaries with SCD suggests the importance of prescription opioids as a treatment option for SCD (NCQA, 2018):

- 80% of beneficiaries with SCD use prescription opioids as a treatment option for managing pain.

- Compared to non-SCD beneficiaries, beneficiaries with SCD had higher emergency department, inpatient and outpatient utilization, and prescriptions with average daily morphine milligram equivalent (MME) dosages ≥ 120.

- Average daily MME dosages ≥ 120 were associated with SCD complications, including pain crises, and higher inpatient and outpatient health care utilization.

These prior findings suggest that beneficiaries with SCD have unique needs with respect to opioids:

- Currently, DMPs restrict opioid analgesics by targeting behaviors associated with risky opioid use in the general population, including: (1) prescriptions for average daily MME ≥120, and (2) a high number of prescribers and/or pharmacies.

- Yet, beneficiaries with SCD have different needs than the general population. What may be "risky opioid use" in the general population may be part of the reality of living with SCD:

    - SCD is marked by chronic and acute pain, requiring both a regular opioid prescription for maintenance and additional prescriptions for acute pain crises—hence, an increased likelihood of average daily MME dosages ≥ 120,

    - Individuals with SCD are living longer, but there is a dearth of hematology specialists that serve adults with SCD that leads to fragmented care coordination—hence a likely increase in the number of health care providers involved in care (Bemrich-Stolz, Halanych, Howard, Hilliard, & Lebensburger, 2015; Hulihan, Hassell, Raphael, Smith-Whitley & Thorpe, 2017).

Overarching objectives of the report

To help inform future policy decisions related to opioid policies and their applicability to Medicare beneficiaries with SCD, and building on prior efforts, this report compares opioid utilization patterns among Medicare FFS beneficiaries with SCD and two already-exempted populations with complex pain syndromes: non-SCD beneficiaries with active cancer and non-SCD beneficiaries in hospice care. For context, this report also provides results for the general Medicare FFS population. Specifically, the report provides a comparison of beneficiaries in these three populations who use opioids at doses that equal to or exceed an average daily morphine milligram equivalent (MME) of 120 (MME≥ 120), the MME threshold that aligns with Pharmacy Quality Alliance opioid measures in effect in 2016 during the study's measurement period, and that defined "high dose opioid use" as daily use exceeding 120 MME.

METHODS

Data source

The primary data source for the study is the CMS Virtual Research Data Center: the Chronic Conditions Data Warehouse (CCW). The CCW includes the Master Beneficiary Summary File (MBSF), which provides data on Medicare claims and prescription drug fills, history of a variety of chronic conditions, demographic data, Medicare enrollment status and eligibility data for beneficiaries.

To examine opioid utilization, this study used the 2016 MBSF and the 2016 Medicare Part D prescription drug event (PDE) records of all Medicare FFS beneficiaries to examine opioid utilization. To identify individuals with SCD, the study used 2012–2016 claims data. To identify individuals with a cancer diagnosis or use of hospice care, the study used 2016 claims data. Opioid prescription fills and medication utilization were examined during the study period of January 1–December 31, 2016. Information on history of health conditions from the MBSF was examined during the 12 months of the study observation period, January 1–December 31, 2016.

Study sample

The study sample included 13,741,356 U.S.-dwelling Medicare FFS beneficiaries ages 18–75 with 12 months of continuous Medicare coverage for medical (Part A and Part B) and pharmacy (Part D) benefits coverage between January 1 and December 31, 2016. Of these, 0.1% (n=7,377) had SCD, 18.0% (n=2,472,214) were non-SCD beneficiaries with cancer and 6.3% (n=868,812) were non-SCD beneficiaries in hospice care (**Figure 1**). The remaining 75.6% (n=10,392,953) were non-SCD FFS beneficiaries who did not have cancer and who were not in hospice care.

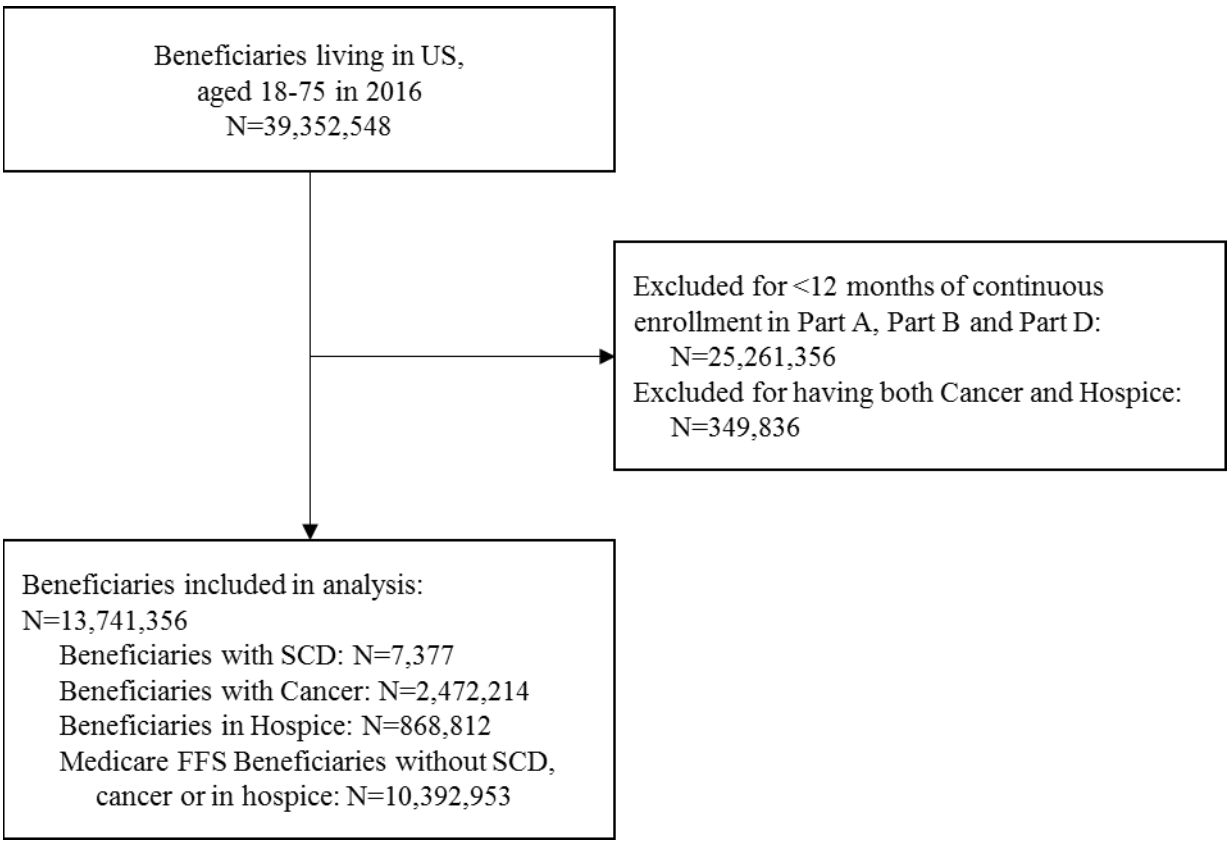
SCD population. Medicare beneficiaries with SCD were identified using institutional and noninstitutional FFS claims between January 1, 2012, and December 31, 2016. Based on guidance from CMS and Centers for Disease Control & Prevention (CDC), individuals were included in the sample if they had an SCD diagnosis code (ICD-9-CM (282.6x, 282.41, 282.42) or ICD-10-CM (D57.0, D57.1, D57.2, D57.4, D57.8) in three or more separate health care claims over a 5-year period (see **Supplemental Table 1** for more details on ICD codes for SCD identification). Because individuals with SCD tend to be high utilizers of health care, claims were separated by at least one day to account for multiple claims that may be associated with a single health care visit. The analysis excluded individuals who only had diagnostic codes associated with the sickle cell trait (ICD-9 282.5, ICD-10 D57.3), because these individuals do not typically exhibit symptoms of SCD and pain crises are rare among them (CDC, 2017a).

Cancer population. Medicare beneficiaries with cancer during 2016 were identified using ICD-10 cancer-related diagnosis codes provided by CMS (see **Supplemental Table 2** for a complete list of diagnosis codes). Beneficiaries identified with SCD or in hospice care were excluded from this population.

Hospice Care population. Medicare beneficiaries who received hospice care were identified using institutional and noninstitutional FFS claims between January 1 and December 31, 2016. Any beneficiary with a hospice claim for 2016 or an inpatient or outpatient claim with a hospice-related revenue center or Healthcare Common Procedure Coding System (HCPCS) code was included in the hospice care population (see **Supplemental Table 3** for a complete list of hospice-related revenue center codes). Beneficiaries identified with SCD or with a cancer diagnosis in 2016 were excluded from this population.

General Medicare population. To provide context, the analysis also examined opioid utilization among Medicare FFS beneficiaries without SCD, cancer or hospice care.

Figure 1: Flow Diagram of Medicare FFS Beneficiaries Included in Analysis



Measures

Opioid Prescription Fills

Opioid dose and group categorization. The study used CDC methods for identifying opioid prescriptions and calculating MME doses (Dowell et al., 2016). Opioid prescriptions were identified by matching national drug code in the PDE file to the CDC list of MME conversion codes (CDC, 2018a).

The daily dose in MME was calculated as the daily dose in milligrams (mg) of a particular drug, multiplied by the drug-specific MME conversion factor:

- For example, if a daily dose for a medication is 20 mg and the conversion factor for that medication is 1.5, the daily MME equals 30.

- For days with multiple prescriptions, MME was calculated for each prescription separately and summed to yield a single daily MME dosage.

- Each beneficiary was assigned an average daily MME dose by dividing the sum total daily MME for each beneficiary by the days in the "treatment period":

    - "Treatment period" was defined as the number of days between the first day of the beneficiary's first opioid prescription and the last day of the beneficiary's final opioid prescription in 2016 (the date of the final prescription plus the days supplied).

    - This definition of a treatment period is aligned with current Medicare Part D Overutilization Monitoring System (OMS) methodology.

Because there are no SCD-specific opioid dosing guidelines (NIH National Heart, Lung, and Blood Institute, 2017), opioid dosing cut points for this report were chosen to align with: (1) CDC *Guideline for Prescribing Opioids for Chronic Pain*[4] and (2) the "Use of Opioids at High Dosage in Persons Without Cancer" (NQF #2940) and "Use of Opioids from Multiple Providers and at High Dosage in Persons Without Cancer" (NQF #2951) quality measures developed by the Pharmacy Quality Alliance (PQA) (NQF, 2017a; NQF, 2017b):

- The CDC Guideline caution providers to carefully assess the risks and benefits of increasing opioid dosage to ≥50 MME/day and to avoid or justify increasing the dosage to ≥90 MME/day (CDC, 2017b; CDC, 2017c; Dowell et al., 2016).

- The PQA's opioid measures define "high dose opioid use" as daily use exceeding 120 MME (NQF, 2017a; NQF, 2017b; CMS, 2018a).

Results were similar, whether populations were categorized using the MME level mentioned by the CDC or the PQA's 120 MME measure thresholds. Hence, this report focuses on results using the MME ≥ 120 cut point, to align with existing quality measure definitions of high-dose opioids in 2016. Results for the ≥90 MME threshold are provided in the Appendix (Supplementary Tables 4–6).

[4] In April 2019, CDC released guidance that advised against the misapplication of the Guideline for Prescribing Opioids for Chronic Pain. Cited examples of misapplication included applying the Guideline to patients in active cancer treatment, patients experiencing acute sickle cell crises, or patients experiencing post-surgical pain.

For context, this report also includes data on any beneficiary with a prescription fill for an opioid, regardless of dosage.

Number of opioid fills per beneficiary. The analysis evaluated both the raw number of opioid prescription fills and the number of prescription fills, normalized to a 30-day length of time ("30 day normed"). When normalized to 30 days, for example, a prescription written for a 90-day supply would be considered 3 fills (90 days divided by 30 days equals 3), and a prescription for a 7-day supply would be considered 0.23 of a fill (7 days divided by 30 days equals 0.23). The total number of 30-day normed prescriptions was calculated for each beneficiary. This report focuses on a 30-day normed results to align with industry standards and OMS methodologies; raw numbers are provided in the Appendix (Supplementary Table 5).

Prescription duration. The duration of each prescription fill was measured using days supply for each raw (not a 30-day normed) opioid prescription fill. Days supply was categorized into three groups: 1–10 days, 11–20 days, and 21 days or more, per CMS's recommendation.

Demographic and Clinical Characteristics

Beneficiary demographic characteristics. Demographic characteristics of beneficiaries used in this study included age categories (18–25, 26–30, 31–45, 46–54, 55–64 and 65–75 years), sex, race and ethnicity, current Medicare entitlement status, dual eligibility for Medicaid and Medicare during the observation year, death status, census division of residence, and rurality of residence (metropolitan area and rural area, as designated by core-based statistical area).

Clinical characteristics. Beneficiaries' clinical characteristics were defined by the existence of other chronic conditions during 2016, including chronic obstructive pulmonary disease (COPD) and bronchiectasis; diabetes; congestive heart failure (CHF); hip or pelvic fracture; hypertension; rheumatoid arthritis or osteoarthritis; alcohol use disorders; anxiety disorders; depressive disorders; fibromyalgia, chronic pain or fatigue; and migraine or chronic headache. Each condition was considered present if the beneficiary met the claims criteria within the chronic condition algorithm by the end of the observation year (End-of-Year Flag = 1 or 3). Level of multimorbidity was calculated as the total number of above listed conditions present, and presented in discrete categories: 0–1, 2–3, 4–5, or 6+ comorbidities.

Utilization

Medication utilization. Non-steroidal anti-inflammatory drug (NSAIDs) use has been shown to be related to management of pain crisis and prescription opioid use (Han, Zhou, Saraf, Gordeuk, & Calip, 2017). Beneficiaries were defined as having NSAID use if an NSAID prescription was associated with the beneficiary in the PDE file during the study observation year.

Health care utilization. History of outpatient, inpatient, and ED utilization in the study year were used to measure health care utilization (all-cause). ED use included:

- All visits, whether the patient was discharged from the ED, became hospitalized at the same facility or was transferred to another facility.
- Any inpatient or outpatient claim with one or more of the following revenue center codes: 0450, 0451, 0452, 0456, 0459.

Refer to Supplemental Table 7 for detailed information on the CCW variables used.

Analysis

Descriptive univariate and bivariate analyses were conducted to examine the distribution of Medicare FFS beneficiaries with SCD, non-SCD beneficiaries with cancer, and non-SCD beneficiaries in hospice care in 2016 across demographic, clinical and health care utilization characteristics. Opioid utilization patterns related to prescription fills, duration, and chronicity (accounting for both dosage levels and duration) were assessed. For context, results for the general FFS population are also provided.

The report provides results for those who received any opioid prescription, regardless of dosage, as well as the subset who had average daily MME dosages ≥ 120. All analyses were conducted using SAS Enterprise Guide 7.12 (SAS Institute Inc, 2016). Frequencies and percent distributions are reported.

RESULTS

This section describes the results in the following order:

(1) Overall demographics, utilization, and health care characteristics of beneficiaries with SCD, non-SCD beneficiaries with cancer, and non-SCD beneficiaries in hospice care—with results for general FFS beneficiaries provided for context,

Then, among the subset of beneficiaries with average daily MME ≥ 120:

(2) Demographics, utilization, and health characteristics of this subset

(3) Opioid utilization patterns of this subset.

Characteristics of Medicare FFS Beneficiaries Overall: Beneficiaries with SCD vs. Cancer vs. Hospice Care

Table 1 displays characteristics of the SCD, cancer, and hospice populations (with the FFS population included to provide context). Results for beneficiaries with any MME, regardless of dose, are provided.

Demographic characteristics. Overall, there was a higher percentage of females than males (58.2% SCD, 52.1% cancer, 58.4% hospice (**Table 1).** Compared to beneficiaries with cancer or in hospice, beneficiaries with SCD were younger (mean age: 42.7 years for SCD vs. 68.2 years for cancer vs. 65.1 years for hospice), predominantly Black/African-American (91.0%), more likely to qualify for Medicare based on a disability (89.9% SCD, 13.5% cancer, 32.9% hospice), more likely to be dual eligible for Medicare and Medicaid (82.9% SCD; 17.4% cancer; 52.5% hospice), and more likely to reside in metropolitan areas (88.1% SCD; 81.0% cancer; 79.4% hospice).

Overall, beneficiaries with cancer and beneficiaries in hospice were more similar to the general FFS beneficiaries than to beneficiaries with SCD. Beneficiaries with cancer were least likely to qualify for Medicare based on a disability or to be dual eligible, with percentages even lower than the overall FFS general population.

Clinical characteristics. Overall, the median number of chronic conditions among beneficiaries with SCD was similar to beneficiaries with cancer, but lower than among beneficiaries in hospice. As seen in **Table 1**, among beneficiaries with SCD, the most prevalent health conditions were fibromyalgia, chronic pain, and fatigue (50.1%). In contrast, the most prevalent chronic condition among beneficiaries with cancer and in hospice was similar to that of the general FFS beneficiaries: hypertension (59.9% cancer, 77.4% hospice, and 50.5% FFS).

All three beneficiary groups had greater prevalence of chronic health conditions than the general FFS population.

Table 1: Characteristics of Medicare FFS Beneficiaries with SCD, Cancer, or Hospice Care

	Total Population Regardless of Opioid Use							
	SCD		Cancer Only		Hospice Only		FFS General	
	N	%	N	%	N	%	N	%
Total[a]	7,377	0.1	2,472,214	18.0	868,812	6.3	10,392,953	75.6
Percentage of total with any daily MME dosage[b]	5,931	80.4	970,067	39.2	571,013	65.7	3,467,159	33.4
Mean Age, years	42.7 (SD=13.6)		68.2 (SD=7.0)		65.1 (SD=9.4)		63.7 (SD=11.4)	
Age, years[b]								
18-25 yo	489	6.6	2,215	0.1	1,613	0.2	75,848	0.7
26-30	1,119	15.2	5,543	0.2	3,996	0.5	149,624	1.4
31-45	2,999	40.7	45,105	1.8	38,187	4.4	776,774	7.5
46-54	1,202	16.3	80,350	3.3	72,051	8.3	854,078	8.2
55-64	887	12.0	204,790	8.3	175,126	20.2	1,415,314	13.6
65-75	681	9.2	2,134,211	86.3	577,839	66.5	7,121,315	68.5
Sex[b,c]								
Male	3,080	41.8	1,184,672	47.9	361,193	41.6	4,662,015	44.9
Female	4,297	58.2	1,287,542	52.1	507,619	58.4	5,730,936	55.1
Race and Ethnicity[b]								
Non-Hispanic White	236	3.2	2,095,014	84.7	604,789	69.6	7,873,219	75.8
Black (African American)	6,710	91.0	163,336	6.6	151,977	17.5	1,212,582	11.7
Hispanic	188	2.5	94,079	3.8	77,341	8.9	696,880	6.7
Asian/Pacific Islander	39	0.5	39,403	1.6	15,689	1.8	280,055	2.7
AI/AN	13	0.2	7,033	0.3	5,372	0.6	68,496	0.7
Other	58	0.8	15,595	0.6	5,408	0.6	75,872	0.7
Unknown	133	1.8	57,754	2.3	8,236	0.9	185,849	1.8
Current Medicare Status[b]								
Aged without ESRD	632	8.6	2,121,580	85.8	552,213	63.6	7,073,529	68.1
Aged with ESRD	49	0.7	12,631	0.5	25,626	2.9	47,786	0.5
Disabled without ESRD	6,325	85.7	324,599	13.1	260,317	30.0	3,169,731	30.5
Disabled with ESRD	308	4.2	10,644	0.4	25,086	2.9	79,341	0.8
ESRD only	63	0.9	2,760	0.1	5,570	0.6	22,566	0.2
Ever Dually Eligible (2016)[b]								
Not Dual Eligible	1,260	17.1	2,042,115	82.6	412,704	47.5	6,667,294	64.2
Dual Eligible	6,117	82.9	430,099	17.4	456,108	52.5	3,725,659	35.8
Died during 2016[b]								
Not deceased	7,160	97.1	2,429,485	98.3	705,434	81.2	10,152,213	97.7
Deceased	217	2.9	42,729	1.7	163,378	18.8	240,740	2.3
Metropolitan/Rural[b,d]								
Metropolitan	6,502	88.1	2,003,039	81.0	690,058	79.4	7,920,709	76.2
Rural	875	11.9	469,172	19.0	178,754	20.6	2,472,232	23.8
Census Divisions[b]								
New England	224	3.0	149,360	6.0	51,167	5.9	639,055	6.1
Middle Atlantic	926	12.6	373,593	15.1	91,788	10.6	1,322,472	12.7
East North Central	1,005	13.6	355,673	14.4	145,276	16.7	1,736,591	16.7
West North Central	311	4.2	155,120	6.3	44,542	5.1	814,163	7.8
South Atlantic	2,655	36.0	583,992	23.6	185,421	21.3	2,063,939	19.9
East South Central	756	10.2	164,014	6.6	74,184	8.5	829,762	8.0
West South Central	923	12.5	221,124	8.9	134,522	15.5	1,067,216	10.3
Mountain	113	1.5	161,508	6.5	43,894	5.1	651,536	6.3
Pacific	464	6.3	307,830	12.5	98,018	11.3	1,268,219	12.2
Comorbid Conditions[b]								
COPD	774	10.5	295,491	12.0	277,644	32.0	985,293	9.5
Diabetes	1,252	17.0	680,476	27.5	423,842	48.8	2,819,306	27.1
CHF	1,294	17.5	235,650	9.5	304,838	35.1	849,900	8.2
Hip Fracture	13	0.2	3,780	0.2	18,042	2.1	12,140	0.1
Hypertension	3,024	41.0	1,482,016	59.9	672,435	77.4	5,252,963	50.5
Rheumatoid arthritis/ osteoarthritis	1,637	22.2	850,919	34.4	482,453	55.5	2,932,403	28.2
Alcohol Use Disorder	377	5.1	64,727	2.6	69,062	7.9	339,968	3.3
Anxiety	1,735	23.5	419,077	17.0	339,561	39.1	1,863,104	17.9
Depression/Depressive Disorders	2,140	29.0	510,772	20.7	424,574	48.9	2,308,856	22.2
Fibromyalgia, Chronic Pain and Fatigue	3,693	50.1	533,193	21.6	341,893	39.4	2,045,565	19.7
Migraine	805	10.9	95,628	3.9	53,962	6.2	403,096	3.9
Total Comorbidities[b]								
0-1	2,955	40.1	1,026,530	41.5	119,585	13.8	4,865,514	46.8
2-3	2,662	36.1	991,060	40.1	252,197	29.0	3,787,557	36.4
4-5	1,310	17.8	359,131	14.5	286,095	32.9	1,369,514	13.2
6+	450	6.1	95,493	3.9	210,935	24.3	370,368	3.6
Had an NSAID script during observation period[b]								
Had an NSAID script	2,601	35.3	550,592	22.3	255,769	29.4	2,466,598	23.7
Health Care Utilization[b]								
Inpatient Visits								
No Utilization (No admissions)	3,299	44.7	2,117,233	85.6	527,930	60.8	9,194,544	88.5
Had an inpatient admission	4,078	55.3	354,981	14.4	340,882	39.2	1,198,409	11.5
1-3 admissions	2,726	66.8	338,787	95.4	292,756	85.9	1,136,873	94.9
4+ admissions	1,352	33.2	16,194	4.6	48,126	14.1	61,536	5.1
Outpatient Visits (Does not include ED)								
No outpatient visits	344	4.7	98,599	4.0	78,041	9.0	1,075,729	10.4
Had an outpatient visit	7,033	95.3	2,373,615	96.0	790,771	91.0	9,317,224	89.6
1-3 outpatient visits	814	11.6	184,727	7.8	61,385	7.8	1,628,870	17.5
4+ outpatient visits	6,219	88.4	2,188,888	92.2	729,386	92.2	7,688,354	82.5
Emergency Department Visits								
No Utilization (No ED Visits)	1,688	22.9	1,821,963	73.7	398,429	45.9	7,557,176	72.7
Had an ED visit	5,689	77.1	650,251	26.3	470,383	54.1	2,835,777	27.3
1-3 ED visits	2,728	48.0	579,061	89.1	333,452	70.9	2,438,201	86.0
4+ ED visits	2,961	52.0	71,190	10.9	136,931	29.1	397,576	14.0

[a] Percentage of entire study population (SCD, Non-SCD Cancer, Non-SCD Hospice, and FFS General combined).
[b] Percentage of each sub-population.
[c] N = 2 missing value for sex.
[d] N = 12 missing value for rurality

Medication and health care utilization. As seen in **Table 1**, beneficiaries with SCD were prescribed NSAID medications more frequently than beneficiaries with cancer and beneficiaries in hospice (SCD 35.3%, cancer 22.3%, hospice 29.4%).

Among beneficiaries with at least one outpatient visit, a smaller proportion of beneficiaries with SCD had 4 or more outpatient visits, compared to both beneficiaries with cancer and beneficiaries in hospice populations (88.4% with 4+ visits in SCD, compared to 92.2% in both cancer and hospice).

By contrast, compared to beneficiaries with cancer and beneficiaries in hospice, beneficiaries with SCD had both higher inpatient and ED utilization.

- Over half the beneficiaries with SCD had an inpatient admission (55.3%), compared to 14.4% of beneficiaries with cancer and 39.2% of beneficiaries in hospice (**Table 1**). Among beneficiaries with an inpatient admission, beneficiaries with SCD had a higher frequency of admissions (33.2% with 4 or more inpatient admissions), compared to beneficiaries with cancer (4.6%) or in hospice (14.1%).

- Over three quarters of beneficiaries with SCD had an ED visit (77.1%), compared to just over one quarter of beneficiaries with cancer (26.3%) and just over half of beneficiaries in hospice (54.1%, **Table 1**).

- Overall, beneficiaries with SCD had the highest inpatient and ED utilization of all, followed by beneficiaries in hospice. In contrast, the utilization patterns for beneficiaries with cancer were most similar to beneficiaries in general FFS (11.5% in FFS had an inpatient admission, 27.3% had an ED visit, **Table 1**).

Medicare FFS Beneficiaries with Average Daily MME ≥ 120: Beneficiaries with SCD vs. Cancer vs. Hospice Care

The following results focus on beneficiaries with average daily MME ≥ 120, to align with quality measure definitions for opioid high dose in 2016; data on beneficiaries with any daily MME, regardless of dosage, are provided for context. (Results among beneficiaries with the CDC-aligned average daily MME ≥ 90 are provided in the Appendix's Supplementary Tables 4–6 and were similar to results at MME ≥ 120.)

Characteristics of Medicare FFS Beneficiaries with Average Daily MME ≥ 120

Demographic characteristics. Among the subset with average daily MME ≥ 120, beneficiaries with cancer had the lowest percentage of females, followed by beneficiaries with SCD (54.3% SCD, 50.8% cancer, 56.9% hospice; **Table 2**). Compared to beneficiaries with cancer or beneficiaries in hospice, beneficiaries with SCD were predominantly Black/African American (93.5%), more likely to be dual

eligible (86.4% SCD, 48.9% cancer, 60.4% hospice), qualified for Medicare based on a disability (98.1% SCD, 56.2% cancer, 55.3% hospice), and live in metropolitan areas (91.5% SCD, 77.6% cancer, 80.1% hospice). These patterns were similar to what was seen in the larger group with any daily MME dosage. Overall, a larger percentage of the subset with MME ≥ 120 died during 2016 than those with any daily MME.

In general, distributions of demographic characteristics among beneficiaries with cancer were more similar to that of the general FFS beneficiaries than beneficiaries with SCD.

Clinical characteristics. The subset with average daily MME ≥ 120 had a higher prevalence of alcohol use disorder, anxiety, depression/depressive disorders, fibromyalgia/chronic pain/fatigue, and migraine than those with any daily MME (**Table 2)**. However, the prevalence of fibromyalgia, chronic pain, and fatigue was lower among beneficiaries with SCD (76.2% SCD, 80.8% cancer, 80.9% hospice). The prevalence of high comorbidity (≥6 conditions) was greater for beneficiaries in hospice (43.6%) and beneficiaries with cancer (19.5%) than for beneficiaries with SCD (7.0%).

Differences observed within the MME ≥ 120 subset were more magnified among beneficiaries with cancer and beneficiaries in hospice than might be expected—given their prevalence among the larger group with any daily MME dosage—than among beneficiaries with SCD (**Table 2**). For example:

- Compared to those with any daily MME dosage, the prevalence of fibromyalgia, chronic pain, and fatigue within the MME ≥ 120 subset was 1.3 times higher in beneficiaries with SCD (76.2% MME ≥ 120 vs. 58.2% any MME), but 2.2 times higher in beneficiaries with cancer (80.8% vs. 36.7%) and 1.6 times higher in beneficiaries in hospice (80.9% vs. 51.0%).

- Similarly, compared to those with any daily MME dosage, the prevalence of high comorbidity (≥6 conditions) within the MME ≥ 120 subset was similar for beneficiaries with SCD (7.0% MME ≥ 120 vs. 6.9% any MME), but 2.5 times higher for beneficiaries with cancer (19.5% vs. 8.0%) and 1.4 times higher for beneficiaries in hospice (43.6% vs. 30.9%).

Medication utilization and health care utilization. In general, the MME ≥ 120 subset had a lower prevalence of an NSAID prescription fill than beneficiaries with any daily MME (34.4% vs. 39.3% SCD, 31.3% vs. 32.4% cancer, 33.5% vs. 36.1% hospice; **Table 2**).

Compared to those with any daily MME dosage, higher health care utilization was observed among the subset with average daily MME ≥ 120. However, this relationship within the MME ≥ 120 subset was more magnified among beneficiaries with cancer and beneficiaries in hospice than might be expected—given their prevalence among the larger group with any daily MME—than among beneficiaries with SCD (**Table 2**). For example:

- Compared to those with any daily MME, the percentage with an inpatient stay within the MME ≥ 120 subset was 1.2 times higher in beneficiaries with SCD (72.4% MME ≥ 120 vs. 61.1% any

MME) and beneficiaries in hospice (47.5% vs. 40.7%), but 1.5 times higher in beneficiaries with cancer (29.5% vs. 19.5%).

- Similarly, compared to those with any daily MME, the percentage with an ED visit within the subset with MME ≥ 120 was similar for beneficiaries with SCD (84.8% MME ≥ 120 vs. 81.3% any MME), but 1.4 times higher for beneficiaries with cancer (49.7% vs. 35.0%) and 1.1 times higher for beneficiaries in hospice (62.6% vs. 55.9%).

Table 2. Characteristics of Medicare FFS SCD, Cancer, and Hospice Beneficiaries with Average Daily MME ≥120

	Any Daily MME Regardless of Dosage								Average Daily MME ≥120							
	SCD		Cancer Only		Hospice Only		FFS General		SCD		Cancer Only		Hospice Only		FFS General	
	N	%[a]	N	%[a]	N	%[a]	N	%[a]	N	%[b]	N	%[b]	N	%[b]	N	%[b]
Total	5,931	80.4	970,067	39.2	571,013	65.7	3,467,159	33.4	1,767	29.8	43,099	4.4	41,983	7.4	208,953	6.0
Mean Age, years	41.6 (SD=12.8)		67.0 (SD=6.1)		64.7 (SD=9.4)		62.2 (SD=11.2)		40.1 (SD=10.3)		60.9 (SD=9.8)		61.0 (10.1)		57.2 (SD=10.1)	
Age, years																
18-25 yo	384	6.5	857	0.1	773	0.1	14,089	0.4	69	3.9	51	0.1	37	0.1	198	0.1
26-30	941	15.9	2,566	0.3	2,371	0.4	38,138	1.1	270	15.3	249	0.6	214	0.5	1,171	0.6
31-45	2,554	43.1	25,824	2.7	25,933	4.5	301,426	8.7	918	52.0	3,089	7.2	3,288	7.8	26,882	12.9
46-54	971	16.4	50,702	5.2	51,239	9.0	410,041	11.8	322	18.2	6,767	15.7	6,461	15.4	48,994	23.4
55-64	694	11.7	124,905	12.9	120,977	21.2	695,856	20.1	162	9.2	14,141	32.8	13,418	32.0	74,544	35.7
65-75	387	6.5	765,213	78.9	369,720	64.7	2,007,609	57.9	26	1.5	18,802	43.6	18,565	44.2	57,164	27.4
Sex[c]																
Male	2,450	41.3	447,390	46.1	218,117	38.2	1,433,538	41.3	808	45.7	21,216	49.2	18,085	43.1	100,546	48.1
Female	3,481	58.7	522,677	53.9	352,896	61.8	2,033,621	58.7	959	54.3	21,883	50.8	23,898	56.9	108,407	51.9
Race and Ethnicity																
Non-Hispanic White	149	2.5	810,751	83.6	406,651	71.2	2,645,805	76.3	28	1.6	35,631	82.7	32,784	78.1	172,487	82.5
Black (African American)	5,469	92.2	81,511	8.4	98,884	17.3	458,625	13.2	1,653	93.5	4,419	10.3	5,786	13.8	20,454	9.8
Hispanic	133	2.2	40,136	4.1	45,432	8.0	220,616	6.4	33	1.9	1,760	4.1	2,253	5.4	10,238	4.9
Asian/Pacific Islander	17	0.3	10,747	1.1	7,771	1.4	48,878	1.4	*	*	294	0.7	267	0.6	1,141	0.5
AI/AN	*	*	4,223	0.4	3,833	0.7	31,117	0.9	*	*	330	0.8	378	0.9	2,105	1.0
Other	*	*	5,338	0.6	3,155	0.6	19,140	0.6	15	0.8	290	0.7	270	0.6	1,215	0.6
Unknown	113	1.9	17,361	1.8	5,287	0.9	42,978	1.2	28	1.6	375	0.9	245	0.6	1,313	0.6
Current Medicare Status																
Aged without ESRD	353	6.0	757,880	78.1	352,718	61.8	1,983,785	57.2	24	1.4	18,649	43.3	18,161	43.3	56,687	27.1
Aged with ESRD	34	0.6	7,333	0.8	17,002	3.0	23,824	0.7	*	*	153	0.4	404	1.0	477	0.2
Disabled without ESRD	5,263	88.7	195,892	20.2	177,612	31.1	1,402,644	40.5	1,690	95.6	23,901	55.5	22,352	53.2	149,678	71.6
Disabled with ESRD	233	3.9	7,168	0.7	19,366	3.4	44,663	1.3	45	2.5	316	0.7	888	2.1	1,670	0.8
ESRD only	48	0.8	1,794	0.2	4,315	0.8	12,243	0.4	*	*	80	0.2	178	0.4	441	0.2
Ever Dually Eligible (2016)																
Not Dual Eligible	926	15.6	730,504	75.3	276,310	48.4	1,962,295	56.6	240	13.6	22,027	51.1	16,626	39.6	91,579	43.8
Dual Eligible	5,005	84.4	239,563	24.7	294,703	51.6	1,504,864	43.4	1,527	86.4	21,072	48.9	25,357	60.4	117,374	56.2
Died during 2016																
Not deceased	5,766	97.2	946,708	97.6	488,484	85.5	3,364,140	97.0	1,698	96.1	40,208	93.3	32,912	78.4	197,346	94.4
Deceased	165	2.8	23,359	2.4	82,529	14.5	103,019	3.0	69	3.9	2,891	6.7	9,071	21.6	11,607	5.6
Metropolitan/Rural[d]																
Metropolitan	5,218	88.0	759,361	78.3	446,212	78.1	2,533,226	73.1	1,616	91.5	33,435	77.6	33,608	80.1	156,526	74.9
Rural	713	12.0	210,705	21.7	124,801	21.9	933,931	26.9	151	8.5	9,664	22.4	8,375	19.9	52,426	25.1
Census Divisions																
New England	158	2.7	45,798	4.7	31,710	5.6	167,634	4.8	58	3.3	2,362	5.5	2,491	5.9	12,167	5.8
Middle Atlantic	712	12.0	114,790	11.8	55,586	9.7	336,830	9.7	272	15.4	5,840	13.6	4,664	11.1	25,473	12.2
East North Central	814	13.7	144,741	14.9	97,309	17.0	587,020	16.9	267	15.1	5,844	13.6	6,243	14.9	30,079	14.4
West North Central	249	4.2	63,949	6.6	30,406	5.3	271,788	7.8	84	4.8	2,752	6.4	2,365	5.6	14,565	7.0
South Atlantic	2,132	35.9	235,352	24.3	123,742	21.7	728,473	21.0	649	36.7	10,290	23.9	9,409	22.4	46,881	22.4
East South Central	645	10.9	81,409	8.4	52,339	9.2	355,199	10.2	122	6.9	3,364	7.8	3,311	7.9	18,412	8.8
West South Central	780	13.2	100,655	10.4	89,580	15.7	405,997	11.7	155	8.8	3,673	8.5	5,137	12.2	18,714	9.0
Mountain	88	1.5	64,970	6.7	29,707	5.2	217,042	6.3	31	1.8	2,859	6.6	3,012	7.2	14,863	7.1
Pacific	353	6.0	118,403	12.2	60,634	10.6	397,176	11.5	129	7.3	6,115	14.2	5,351	12.7	27,799	13.3

	Any Daily MME Regardless of Dosage								Average Daily MME ≥120							
	SCD		Cancer Only		Hospice Only		FFS General		SCD		Cancer Only		Hospice Only		FFS General	
	N	%[a]	N	%[a]	N	%[a]	N	%[a]	N	%[b]	N	%[b]	N	%[b]	N	%[b]
Comorbid Conditions																
COPD	674	11.4	170,639	17.6	199,431	34.9	538,268	15.5	193	10.9	12,052	28.0	17,475	41.6	42,600	20.4
Diabetes	920	15.5	311,478	32.1	284,767	49.9	1,140,544	32.9	196	11.1	13,558	31.5	18,576	44.2	60,274	28.8
CHF	1,118	18.9	126,748	13.1	205,517	36.0	417,239	12.0	367	20.8	7,035	16.3	14,566	34.7	25,205	12.1
Hip Fracture	13	0.2	2,769	0.3	14,149	2.5	8,173	0.2	*	*	178	0.4	882	2.1	449	0.2
Hypertension	2,452	41.3	654,168	67.4	463,728	81.2	2,119,973	61.1	657	37.2	25,977	60.3	30,421	72.5	107,842	51.6
Rheumatoid arthritis/ osteoarthritis	1,460	24.6	473,674	48.8	379,033	66.4	1,674,485	48.3	413	23.4	25,049	58.1	28,114	67.0	121,746	58.3
Alcohol Use Disorder	309	5.2	37,172	3.8	46,592	8.2	163,157	4.7	98	5.5	2,598	6.0	3,871	9.2	11,894	5.7
Anxiety	1,520	25.6	240,083	24.7	246,871	43.2	989,057	28.5	543	30.7	18,886	43.8	23,736	56.5	87,406	41.8
Depression/Depressive Disorders	1,822	30.7	286,465	29.5	298,211	52.2	1,178,176	34.0	625	35.4	20,899	48.5	26,746	63.7	97,142	46.5
Fibromyalgia, Chronic Pain and Fatigue	3,449	58.2	356,431	36.7	291,046	51.0	1,419,256	40.9	1,346	76.2	34,830	80.8	33,965	80.9	166,072	79.5
Migraine	718	12.1	58,592	6.0	45,542	8.0	251,975	7.3	226	12.8	4,649	10.8	4,928	11.7	22,449	10.7
Total comorbidities																
0-1	2,159	36.4	245,147	25.3	55,350	9.7	856,550	24.7	531	30.1	4,578	10.6	4,471	10.6	28,908	13.8
2-3	2,184	36.8	414,409	42.7	144,645	25.3	1,433,861	41.4	713	40.4	14,439	33.5	5,984	14.3	75,199	36.0
4-5	1,178	19.9	232,652	24.0	194,696	34.1	875,428	25.2	400	22.6	15,699	36.4	13,234	31.5	72,619	34.8
6+	410	6.9	77,859	8.0	176,322	30.9	301,320	8.7	123	7.0	8,383	19.5	18,294	43.6	32,227	15.4
Had an NSAID script during observation period																
Had an NSAID script	2,331	39.3	314,154	32.4	206,318	36.1	1,356,687	39.1	607	34.4	13,503	31.3	14,051	33.5	75,642	36.2
Health Care Utilization																
Inpatient Visits (2015)																
No Utilization (No admissions)	2,311	39.0	780,452	80.5	338,647	59.3	2,869,578	82.8	487	27.6	30,376	70.5	22,029	52.5	165,383	79.1
Had an inpatient admission	3,620	61.1	189,615	19.5	232,366	40.7	597,581	17.3	1,280	72.4	12,723	29.5	19,954	47.5	43,570	20.9
1-3 admissions	2,340	64.6	178,591	94.2	197,074	84.8	560,893	93.9	716	55.9	11,422	89.8	16,206	81.2	40,192	92.2
4+ admissions	1,280	35.4	11,024	5.8	35,292	15.2	36,688	6.1	564	44.1	1,301	10.2	3,748	18.8	3,378	7.8
Outpatient Visits (Does not include ED) (2015)																
No outpatient visits	207	3.5	33,582	3.5	42,822	7.5	196,535	5.7	19	1.1	934	2.2	3,774	9.0	8,471	4.1
Had an outpatient visit	5,724	96.5	936,485	96.5	528,191	92.5	3,270,624	94.4	1,748	98.9	42,165	97.8	38,209	91.0	200,482	95.9
1-3 outpatient visits	566	9.9	53,551	5.7	31,836	6.0	332,021	10.2	105	6.0	1,323	3.1	1,624	4.3	10,940	5.5
4+ outpatient visits	5,158	90.1	882,934	94.3	496,355	94.0	2,938,603	89.8	1,643	94.0	40,842	96.9	36,585	95.7	189,542	94.5
Emergency Department Visits (2015)																
No Utilization (No ED Visits)	1,106	18.6	630,988	65.0	252,042	44.1	2,115,682	61.0	269	15.2	21,676	50.3	15,689	37.4	115,120	55.1
Had an ED visit	4,825	81.3	339,079	35.0	318,971	55.9	1,351,477	39.0	1,498	84.8	21,423	49.7	26,294	62.6	93,833	44.9
1-3 ED visits	2,108	43.7	288,617	85.1	217,878	68.3	1,096,119	81.1	558	37.2	16,502	77.0	16,691	63.5	74,806	79.7
4+ ED visits	2,717	56.3	50,462	14.9	101,093	31.7	255,358	18.9	940	62.8	4,921	23.0	9,603	36.5	19,027	20.3

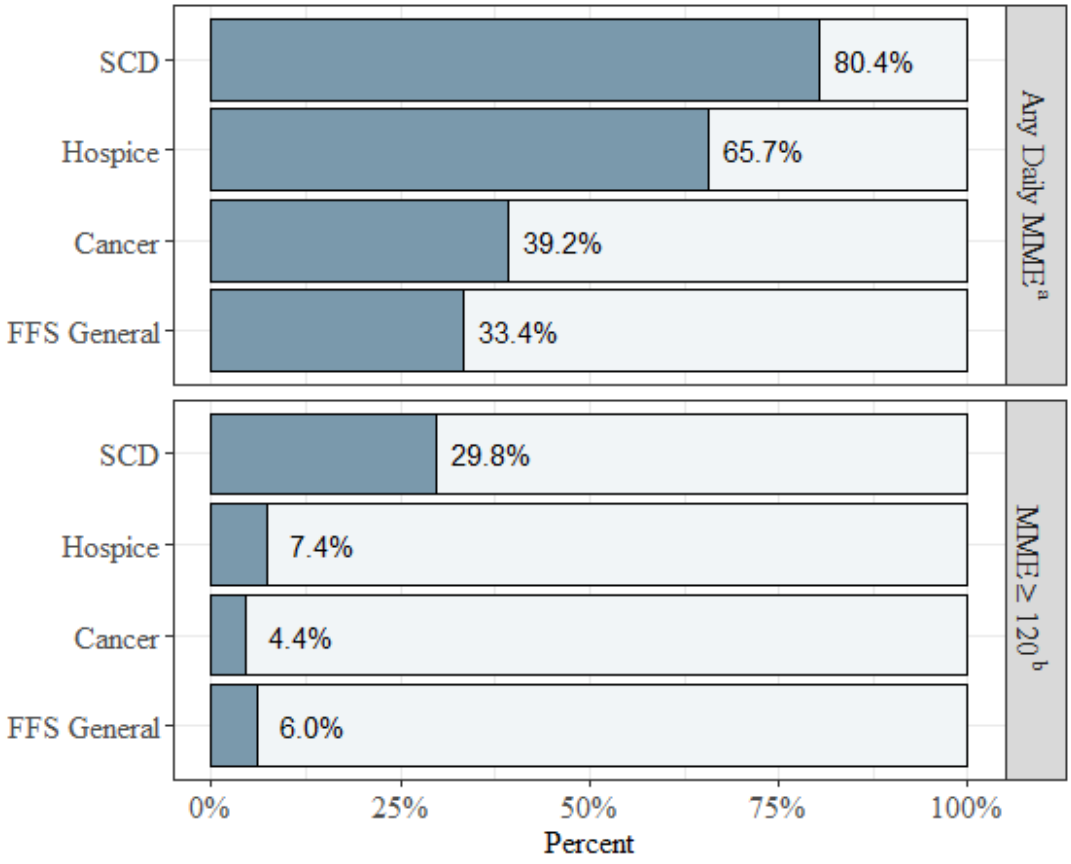
[*] Cells under 11 have been masked for privacy.
[a] Percentage of subpopulation with at least one opioid prescription fill.
[b] Percentage of subpopulation with at least one opioid prescription fill whose average daily dosage was MME ≥120.
[c] N = 2 missing value for sex.
[d] N = 12 missing value for rurality.

Opioid Utilization in Medicare FFS Beneficiaries with Average Daily MME ≥ 120

Prevalence of Opioid Utilization. Overall, among the subset of beneficiaries who filled at least one opioid prescription, the prevalence of opioid fills was highest among beneficiaries with SCD (80.4%), followed by beneficiaries in hospice (65.7%). Prevalence of opioid fills was lowest among beneficiaries with cancer (39.2%), who were most similar to general FFS beneficiaries (33.4%) (**Figure 2**).

Among the subset of beneficiaries who filled at least one opioid prescription, prevalence rates of average daily MME ≥ 120 were highest among beneficiaries with SCD (29.8%). In contrast, prevalence rates of average daily MME ≥ 120 among beneficiaries in hospice (7.4%) and beneficiaries with cancer (4.4%) were more similar to the general FFS beneficiaries (6.0%) (**Figure 2**).

Figure 2. Percentage of Beneficiaries Prescribed Opioids, by Population and Dosage



[a] Percent of all beneficiaries in subpopulation; [b] Percent of those with an opioid fill.

Number of Opioid Prescription Fills (30-Day Normed). Among those with any opioid prescription fills, beneficiaries with SCD had the highest percentage of fills ≥ 120 MME.

- Beneficiaries with SCD filled a total of 65,845 30-day normed opioid prescriptions in 2016, of which 59.9% (39,417 fills) were by beneficiaries with average daily MME ≥ 120 (**Table 3**).

- Beneficiaries with cancer filled a total of 3,884,659 30-day normed opioid prescriptions, of which only 22.4% (871,873 fills) were by those with average daily MME ≥ 120

- Beneficiaries in hospice filled a total of 3,269,799 30-day normed opioid prescriptions, of which only 22.7% (742,610 fills) were by those with average daily MME ≥ 120.

Among those with an average daily MME ≥ 120, beneficiaries with SCD also had higher median per-beneficiary number of 30-day normed prescriptions (23.0 fills, compared to beneficiaries with cancer (22.1 fills) or beneficiaries in hospice (18.8 fills) (**Table 3)**. In contrast, the percentages for beneficiaries with cancer and beneficiaries in hospice were most similar to general FFS beneficiaries (23.2%, or 4,343,536 fills among the MME ≥ 120 subset; 18,658,037 fills among those with any daily MME) (**Table 3**).

Table 3: Opioid Prescriptions Fills and Days Supply, by Population

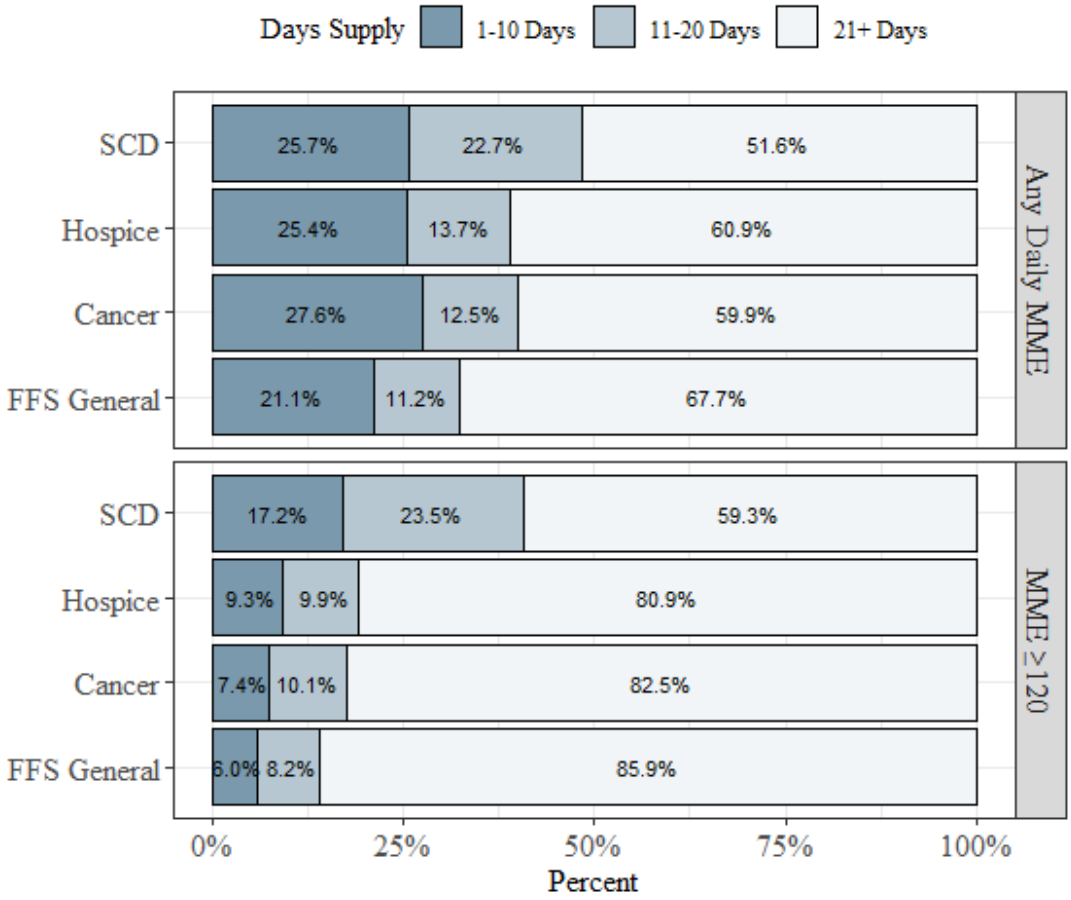
			Number of Opioid Prescription Fills per Beneficiary (30-day Normed [a,b])						Days Supply per Prescription				
Beneficiary Average Daily MME	**Population**	**Total Beneficiaries**	**Total Fills (Normed)**	**Median**	**IQR[c]**	**Range**	**Mean**	**SD[d]**	**Median**	**IQR[c]**	**Range**	**Mean**	**SD[d]**
Any Daily MME Dosage	SCD	5,931	65,845	9.10	1.67-17.87	0.03-133.60	11.10	10.38	23	10-30	1-90	20.5	10.6
	Cancer Only	970,067	3,884,659	0.67	0.17-5.23	0.03-98.83	4.00	6.47	30	10-30	1-310	22.0	13.2
	Hospice Only	571,013	3,269,799	2.40	0.60-9.60	0.03-82.53	5.73	6.96	30	10-30	1-999	22.1	11.6
	FFS General	3,467,159	18,658,037	1.30	0.23-10.00	0.03-114.83	5.38	7.27	30	15-30	1-500	23.5	12.0
MME ≥120	SCD	1,767	39,417	23.00	16.37-26.57	0.17-133.60	22.31	9.40	30	14-30	1-90	22.5	9.8
	Cancer Only	43,099	871,873	22.10	13.23-26.47	0.03-98.83	20.23	9.78	30	28-30	1-150	26.9	8.5
	Hospice Only	41,983	742,610	18.83	10.50-26.00	0.03-78.60	17.69	10.29	30	28-30	1-350	26.4	8.6
	FFS General	208,953	4,343,536	23.33	13.57-26.67	0.03-114.83	20.79	9.21	30	28-30	1-365	27.3	7.7

[a] Prescriptions are normed to a 30-day supply by dividing the days duration by 30.
[b] Summary statistics are presented to the second decimal place to reflect that they have been normalized to 30 days.
[c] IQR: Interquartile range.
[d] SD: Standard Deviation

Days Supply of Opioid Prescription Fills. Despite having a higher median number of opioid fills, and the highest percentage with average daily MME ≥ 120, beneficiaries with SCD had shorter average days supply per raw opioid prescription fill (22.5 days), compared to beneficiaries with cancer (26.9 days) or beneficiaries in hospice (26.4 days) (**Table 3**).

Beneficiaries with SCD were also the only beneficiary group to have a median days supply per fill less than 30 days (**Table 3**). Differences among beneficiary groups were magnified for the longer-duration prescriptions with 21 or more days supply. Among the subset with MME ≥ 120, only 59.3% of fills for beneficiaries with SCD were for 21 days or more, compared to over 80% of fills for beneficiaries with cancer (82.5%), in hospice (80.9%) or in general FFS (85.9%) (**Figure 3**).

Figure 3. Percentage of Opioid Prescription Fills by Population and Days Supply.



DISCUSSION

This report compared opioid utilization patterns among Medicare FFS beneficiaries with SCD to the two already-exempted populations with complex pain syndromes: non-SCD beneficiaries with cancer and non-SCD beneficiaries in hospice care.

Findings suggest several themes:

- **Socio-demographics:** Compared to beneficiaries with cancer or in hospice, beneficiaries with SCD were younger, predominantly Black/African American, more likely to qualify for Medicare based on a disability, be dual eligible for Medicare and Medicaid, and be in urban areas.
    - Overall, these patterns indicate higher sociodemographic vulnerabilities among beneficiaries with SCD.
- **Pain related conditions:** Compared to beneficiaries with cancer and beneficiaries in hospice, pain-related conditions—fibromyalgia, chronic pain, fatigue—were most prevalent in beneficiaries with SCD
    - This suggests that beneficiaries with SCD have higher pain-related disease burden and need for chronic pain management.
    - Yet, the proportion of beneficiaries with SCD who were prescribed opioids at MME $\geq$ 120 was similar to the proportions of beneficiaries with cancer or in hospice who were prescribed MME $\geq$ 120.
    - This pattern suggests that beneficiaries with SCD may face disproportionate challenges in accessing opioids for pain-related complications; this is consistent with literature suggesting that those with SCD face more pain-related burden (Haywood et al., 2014; Mathur et al., 2016).
- **Inpatient admissions and ED visits:** Compared to beneficiaries with cancer and beneficiaries in hospice, beneficiaries with SCD had less frequent outpatient office visits but higher inpatient admissions and ED visits.
    - This pattern suggests that beneficiaries with SCD may face worse quality of care for pain management, as indicated by a potential reliance on high-intensity acute care services for pain management.
    - Among those prescribed opioids at MME $\geq$120, the proportion of beneficiaries with cancer or in hospice who had an inpatient admission or ED visit was higher than would be expected, given their prevalence among those with any daily MME. Yet among

beneficiaries with SCD, the proportions with an inpatient admission or ED visit did not differ by dosage level – whether at any daily MME or MME ≥120.

- **Opioid prescriptions:** Overall, a higher proportion of beneficiaries with SCD had at least one opioid prescription fill, compared to beneficiaries with cancer or beneficiaries in hospice. In fact, beneficiaries with cancer were prescribed opioids the least.

    - Among the subset of beneficiaries who filled at least one prescription, prescriptions for average daily MME ≥ 120 was highest among beneficiaries with SCD, compared to beneficiaries with cancer or in hospice.

    - These patterns suggest that opioids are as important a treatment option for beneficiaries with SCD, as it is for beneficiaries with cancer or in hospice.

- **Duration (days supply) of opioid prescriptions:** Although beneficiaries with SCD filled more opioid prescriptions with average daily MME ≥ 120 than beneficiaries with cancer or in hospice, fills for a 21-day or more supply were lowest among beneficiaries with SCD, compared to beneficiaries with cancer or in hospice.

    - Prescriptions of shorter durations suggests that beneficiaries with SCD may need to go back to a prescriber more frequently for new prescriptions in order to continue active treatment for SCD-related pain.

    - Combined with their higher prescription fills, shorter duration prescriptions imply that the burden of pain management is likely higher among beneficiaries with SCD, compared to exempted beneficiaries with cancer or in hospice.

Limitations

Several limitations apply to these findings.

- First, results may not generalize beyond FFS beneficiaries in 2016.

- Second, as is typical with claims data, the diagnosis is only as good as its source. It is possible that individuals with SCD were excluded from the study sample due to misdiagnosis or failure to accurately record the appropriate SCD code (Virnig & Parsons, 2018). Similarly, it is also possible that the designation of a cancer diagnosis may have failed to capture beneficiaries who were misdiagnosed or where there was a failure to accurately record an appropriate cancer code. There is also the possibility that someone who was in an end-of-life phase or who may qualify for hospice care was not receiving it and thus not captured in the data.

- Third, opioid prescription fills are not synonymous with opioid use or the taking of medication, so actual consumption is unobservable in claims data, as is degree of pain or pain control.

- Fourth, only Medicare Part D-reimbursed opioid fills were included, which may represent an undercount if beneficiaries have alternative sources of opioids.

- Fifth, the limitations of claims data did not allow mapping of individuals' pain profiles to utilization patterns. The PDE data are not tied to specific encounters in the claims data, so it is challenging to accurately identify diagnoses and procedures associated with opioid utilization.

    - This presents challenges in distinguishing appropriate opioid utilization for SCD-related complications vs. current metrics used to identify risky opioid use behavior in the general population, including: (1) prescriptions for average daily MME $\geq$ 120 and (2) a high number of prescribers and/or pharmacies.

    - Yet, the existing restrictions do not consider the pain management needs of beneficiaries with SCD, for whom: (1) average daily MME opioid dosages $\geq$ 120 are strongly associated with SCD complications and pain crises and (2) chronic pain conditions are disproportionately more prevalent. Pain profiles associated with chronic and acute SCD pain require both regular opioid prescriptions for maintenance and additional prescriptions to address acute pain crises.

      Individuals with SCD are living longer, but there is a dearth of hematology specialists that serve adults with SCD, leading to fragmented care coordination—and a likely increase in the number of health care providers involved in care (Bemrich-Stolz et al., 2015; Hulihan et al., 2017).

    - Because current metrics for identifying risky opioid use behavior among the general population overlap with utilization patterns among SCD patients managing complex pain, these data limitations also critically constrain the ability to properly contextualize SCD-specific utilization from general risky opioid use. Efforts to apply current metrics for risky opioid-use behavior among beneficiaries with SCD could exacerbate the stigma they face and create additional challenges to accessing opioid analgesics.

CONCLUSIONS

Our study suggests that the appropriate treatment of beneficiaries with SCD may involve patterns that may cause them to be inappropriately identified for DMPs. For example, although beneficiaries with SCD comprise a smaller share of the Medicare FFS population, they are more likely to have an opioid prescription and more likely to have a prescription with an average daily MME ≥ 120 compared to beneficiaries with cancer or in hospice care.

In April 2019, CDC released guidance that advised against the misapplication of the *Guideline for Prescribing Opioids for Chronic Pain* (CDC, 2018b; Dowell, Haegerich, & Chou, 2019). Cited examples of misapplication included applying the Guideline to patients in active cancer treatment, patients experiencing acute sickle cell crises, or patients experiencing post-surgical pain. Opioid policies may have the potential to impair access to an important treatment option - opioids - for beneficiaries with SCD. While CMS recommends that SCD patients be excluded from some Medicare Part D opioid policies, such as the opioid safety edits, SCD patients are not exempt from DMPs. The result of inclusion in DMPs could be that the benefits of case management are outweighed by the risks that beneficiaries with SCD could face, including challenges in timely access to prescribed opioids, potentially worse quality of care and health-related quality of life, and greater risk of adverse outcomes related to poor pain management. The findings suggest that beneficiaries with SCD should be exempt from DMPs. Also, as further efforts are made to reduce opioid misuse and overutilization, consideration should be given to exempting beneficiaries with SCD. Finally, additional study should be undertaken to understand the impact of current policies on access to pain management for beneficiaries with SCD.

REFERENCES

American Medical Association (AMA). (2017, July 19). *Reversing the opioid epidemic*. Retrieved from https://www.ama-assn.org/delivering-care/reversing-opioid-epidemic

Bemrich-Stolz, C. J., Halanych, J. H., Howard, T. H., Hilliard, L. M., & Lebensburger, J. D. (2015). Exploring adult care experiences and barriers to transition in adult patients with sickle cell disease. *International Journal of Hematology & Therapy, 1(1).* doi: 10.15436/2381-1404.15.003.

Brousseau, D. C., Owens, P. L., Mosso, A. L., Panepinto, J. A., & Steiner, C. A. (2010). Acute care utilization and rehospitalizations for sickle cell disease. *Journal of the American Medical Association, 303(13),*1288-94. doi: 10.1001/jama.2010.378.

Brummett, C., Waljee, J., Goesling, J., Moser, S., Lin, P., Englesbe, M., et al. (2017). New persistent opioid use after minor and major surgical procedures in US adults. *JAMA Surgery*, *152*(6), e170504. doi: 10.1001/jamasurg.2017.0504.

Centers for Disease Prevention and Control (CDC). (2018a). *Analyzing Prescription Data and Morphine Milligram Equivalents (MME)*. Retrieved from https://www.cdc.gov/drugoverdose/resources/data.html.

CDC. (2018b). CDC Advises Against Misapplication of the *Guideline for Prescribing Opioids for Chronic Pain.* Retrieved from https://www.cdc.gov/media/releases/2019/s0424-advises-misapplication-guideline-prescribing-opioids.html

CDC. (2017a). *What You Should Know About Sickle Cell Disease*. Retrieved from https://www.cdc.gov/ncbddd/sicklecell/documents/scd%20factsheet_sickle%20cell%20trait.pdf

CDC. (2017b). *CDC Guideline for Prescribing Opioids for Chronic Pain.* Retrieved from https://www.cdc.gov/drugoverdose/pdf/guidelines_at-a-glance-a.pdf

CDC. (2017c). *Calculating Total Daily Dose of Opioids for Safer Dosage.* Retrieved from https://www.cdc.gov/drugoverdose/pdf/calculating_total_daily_dose-a.pdf

Centers for Medicare & Medicaid Services (CMS) Press. (2018a). *2019 Medicare Advantage and Part D Announcement and Call Letter.* Retrieved from https://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/Downloads/Announcement2019.pdf

CMS Press. (2018b). *2019 Medicare Advantage and Part D Announcement and Call Letter.* Retrieved from https://www.cms.gov/Newsroom/MediaReleaseDatabase/Fact-sheets/2018-Fact-sheets-items/2018-04-02-2.html

CMS Press. (2018c). *CMS Finalizes Policy Changes and Updates for Medicare Advantage and the Prescription Drug Benefit Program for Contract Year 2019 (CMS-4182-F)*. Retrieved from https://www.cms.gov/Newsroom/MediaReleaseDatabase/Fact-sheets/2018-Fact-sheets-items/2018-04-02.html

Dowell, D., Haegerich, T., & Chou, R. (2019). No shortcuts to safer opioid prescribing. *New England Journal of Medicine*, *380(24)*, 2285-2287. doi: 10.1056/NEJMp1904190

Dowell, D., Haegerich, T. M., & Chou, R. (2016). CDC guideline for prescribing opioids for chronic pain – United States, 2016. *MMWR Recommendations and Reports, 65(1),* 1-49. doi: 10.15585/mmwr.rr6501e1.

Elander, J., Lusher, J., Bevan, D., Telfer, P., & Burton, B. (2004). Understanding the causes of problematic pain management in sickle cell disease: evidence that pseudoaddiction plays a more important role than genuine analgesic dependence. *Journal of Pain and Symptom Management, 27(2),* 156-69. doi: 10.1016/j.jpainsymman.2003.12.001.

Han, J., Zhou, J., Saraf, S. L., Gordeuk, V. R., & Calip, G. S. (2017). Characterization of opioid use in sickle cell disease. *Pharmacoepidemiology and Drug Safety, Epub 2017 Aug 16.* doi: 10.1002/pds.4291.

Hassell, K. L. (2010). Population estimates of sickle cell disease in the U.S. *American Journal of Preventive Medicine, 38(4 Supple),* S512-21. doi: 10.1016/j.amepre.2009.12.022.

Haywood, C. Jr., Diener-West, M., Strouse, J., Carroll, C. P., Bediako, S., Lanzkron, S., et al. (2014). Perceived discrimination in health care is associated with a greater burden of pain in sickle cell disease. *Journal of Pain and Symptom Management, 48(5),* 934-43. doi: 10.1016/j.jpainsymman.2014.02.002.

Hulihan, M., Hassell, K.L., Raphael, J.L., Smith-Whitley, K., & Thorpe, P. (2017). CDC Grand Rounds: Improving the lives of persons with sickle cell disease. *MMWR Morbidity and Mortality Weekly Report, 66(46),* 1269-1271. doi: 10.15585/mmwr.mm6646a2.

Jena, A., Goldman, D., & Karaca-Mandic, P. (2016). Hospital prescribing of opioids to Medicare beneficiaries.(Report). *JAMA Internal Medicine, 176(7),* 990–997. doi.org/10.1001/jamainternmed.2016.2737.

Lanzkron, S., Carroll, C. P., & Haywood, C. Jr. (2010). The burden of emergency department use for sickle-cell disease: an analysis of the national emergency department sample database. *American Journal of Hematology, 85(10),* 797-9. doi: 10.1002/ajh.21807.

Mathur, V. A., Kiley, K. B., Haywood, C., Bediako, S. M., Lanzkron, S., Carroll, C. P., et. al. (2016). Multiple levels of suffering: Discrimination in health-care settings is associated with enhanced laboratory

pain sensitivity in sickle cell disease. *Clinical Journal of Pain, 32(12),* 1076-1085. doi: 10.1097/AJP.0000000000000361.

Murthy, V. H. (2016). Ending the opioid epidemic – a call to action. *New England Journal of Medicine, 375(25),* 2413-2415. doi: 10.1056/NEJMp1612578.

National Committee for Quality Assurance (NCQA) (2018). Task 3.3—Opioid prescription in Medicare beneficiaries: How are beneficiaries with sickle cell disease different? (Option Year 2 Deliverable 3.3.5). November 9, 2018. Report submitted to the Centers for Medicare & Medicaid Services. Washington, DC: National Committee for Quality Assurance.

National Institute for Health Care and Excellence (NICE): Centre for Clinical Practice (UK). (2012). Sickle cell disease: managing acute painful episodes in hospital; Clinical Guideline (CG143). British Journal of Haematology, 120(5), 744-52. Retrieved from https://www.nice.org.uk/guidance/CG143/chapter/1-Recommendations#primary-analgesia.

National Institutes of Health (NIH) National Heart, Lung, and Blood Institute. (2014). Evidence-based management of sickle cell disease: Expert panel report, 2014. Retrieved from https://www.nhlbi.nih.gov/health-pro/guidelines/sickle-cell-disease-guidelines

National Institutes of Health (NIH) National Heart, Lung, and Blood Institute. (2017). Opioid crisis adds to pain of sickle cell patients. Retrieved from https://www.nhlbi.nih.gov/news/spotlight/fact-sheet/opioid-crisis-adds-pain-sickle-cell-patients

National Human Genome Research Institute. (2016). Specific genetic disorders: Learning about sickle cell disease. Retrieved from https://www.genome.gov/10001219/learning-about-sickle-cell-disease/

National Quality Forum (NQF). (2017a). Use of Opioids at high dosage in persons without cancer. Steward: Pharmacy Quality Alliance. Retrieved from: http://www.qualityforum.org/QPS/2940

National Quality Forum (NQF). (2017b). Use of opioids from multiple providers and at high dosage in persons without cancer. Steward: Pharmacy Quality Alliance. Retrieved from: http://www.qualityforum.org/QPS/2951

Ruta, N. S. & Ballas, S. K. (2016). The opioid drug epidemic and sickle cell disease: Guilt by association. *Pain Medicine, 17(10),* 1793-98. doi: 10.1093/pm/pnw074.

SAS Institute Inc. (2016). SAS Enterprise Guide 7.12. Cary, NC: SAS Institute Inc.

Sun, E., Darnall, B., Baker, L., & Mackey, S. (2016). Incidence of and risk factors for chronic opioid use among opioid-naive patients in the postoperative period.(Report). *JAMA Internal Medicine*, *176*(9), 1286–1293. doi: 10.1001/jamainternmed.2016.3298.

U.S. Department of Health and Human Services, office of Inspector General. (2017). *Opioids in Medicare Part D: Concerns about Extreme Use and Questionable Prescribing, OEI-02-17-00250.* Retrieved from https://oig.hhs.gov/oei/reports/oei-02-17-00250.pdf

U.S. Department of Health and Human Services, Office of Inspector General (OIG). (2016). *High Part D Spending on Opioids and Substantial Growth in Compounded Drugs Raise Concerns, OEI-02-16-00290*. Retrieved from https://oig.hhs.gov/oei/reports/oei-02-16-00290.pdf

U.S. Department of Health and Human Service, Office of Inspector General (OIG). (2015). *Ensuring the Integrity of Medicare Part D: An OIG Portfolio, OEI-03-15-00180*. Retrieved from https://oig.hhs.gov/oei/reports/oei-03-15-00180.pdf

Virnig, B. & Parsons, H. (2018). Strengths and limitations of CMS administrative data in Research. Research Data Assistance Center (*ResDAC), Article #156.* Retrieved from https://www.resdac.org/resconnect/articles/156

Yawn, B. P. & John-Sowah, J. (2015). Management of sickle cell disease: Recommendations from the 2014 expert panel report. *American Family Physician, 92(12),* 1069-76.

APPENDIX

Supplemental Table 1: ICD-9 and -10 Codes for Sickle Cell Case Identification

ICD Code Version	ICD Code and Description
ICD-9	282.41—Sickle-cell thalassemia without crisis 282.42—Sickle-cell thalassemia with crisis 282.61—Hb-SS disease without crisis 282.62—Hb-SS disease with crisis 282.63—Sickle-cell/Hb-C disease without crisis 282.64—Sickle-cell/Hb-C disease with crisis 282.68—Other sickle-cell disease without crisis 282.69—Other sickle-cell disease with crisis
ICD-10	D57.0—Hb-SS disease with crisis D57.1—Sickle-cell disease without crisis D57.2—Sickle-cell/Hb-C disease D57.4—Sickle-cell thalassemia D57.8—Other sickle-cell disorders

Supplemental Table 2: ICD-10 Codes for Exempted Cancer Patients in Opioid Policies

ICD-10 Codes for Cancer Diagnosis
C00.X-C41.X, C4A.X, C43.X, C45.X-C58.X, C60.X-C79.X, C7A.X, C7B.X, C80.X-C88.X, C90.X-X97.X D37.01, D37.02, D37.03, D37.04, D37.05, D37.09, D37.1, D37.2, D37.3, D37.4, D37.5, D37.6, D37.8, D37.9, D38.0, D38.1, D38.2, D38.3, D38.4, D38.5, D38.6, D39.0, D39.10, D39.11, D39.12, D39.2, D39.8, D39.9, D40.0, D40.10, D40.11, D40.12, D40.8, D40.9, D41.00, D41.01, D41.02, D41.10, D41.11, D41.12, D41.20, D41.21, D41.22, D41.3, D41.4, D41.8, D41.9, D42.0, D42.1, D42.9, D43.0, D43.1, D43.2, D43.3, D43.4, D43.8, D43.9, D44.0, D44.10, D44.11, D44.12, D44.2, D44.3, D44.4, D44.5, D44.6, D44.7, D44.9, D45, D46.0, D46.1, D46.20, D46.21, D46.22, D46.4, D46.9, D46.A, D46.B, D46.C, D46.Z, D47.0, D47.1, D47.2, D47.3, D47.4, D47.9, D47.Z1, D47.Z2, D47.Z9, D48.0, D48.1, D48.2, D48.3, D48.4, D48.5, D48.60, D48.61, D48.62, D48.7, D48.9, D49.0, D49.1, D49.2, D49.3, D49.4, D49.5, D49.51, D49.59, D49.6, D49.7, D49.81, D49.89, D49.9, E34.0, Q85.00, Q85.01, Q85.02, Q85.03, Q85.09, Q85.1, Q85.8, Q85.9

Supplemental Table 3: Criteria for Excluding Medicare Beneficiaries in Hospice

Reason for Exclusion	Description
Presence of hospice claim	Beneficiaries with a claim in the hospice RIF for 2016
Hospice revenue center code	Any inpatient or outpatient claim with a revenue center code of: 0115, 0125, 0135, 0145, 0155, 0235, 0650, 0651, 0652, 0653, 0654, 0655, 0656, 0657, 0658, 0659
HCPCS Code	Any inpatient or outpatient claim with a HCPCS code of: 99377, 99378, G0182, G0337, G9474, G9475, G9476, G9477, G9478, G9479, G9524, Q5001, Q5002, Q5003, Q5004, Q5005, Q5006, Q5007, Q5008, Q5009, Q5010, S0255, S9126, T2042, T2043, T2044, T2045, T2046

Supplemental Table 4: Characteristics of Medicare FFS Beneficiaries with SCD, Cancer or Hospice Care (using Average Daily MME ≥90)

	Any Daily MME Regardless of Dosage								Average Daily MME ≥ 90							
	SCD		Cancer Only		Hospice Only		FFS General		SCD		Cancer Only		Hospice Only		FFS General	
	N	(%)[b]	N	(%)[b]	N	(%)[b]	N	(%)[b]	N	(%)[c]	N	(%)[c]	N	(%)[c]	N	(%)[c]
Total	5,931	80.4	970,067	39.2	571,013	65.7	3,467,159	33.4	2,073	35.0	65,327	6.7	61,182	10.7	290,904	8.4
Age group category																
18-25 yo	384	6.5	857	0.1	773	0.1	14,089	0.4	89	4.3	74	0.1	53	0.1	338	0.1
26-30	941	15.9	2,566	0.3	2,371	0.4	38,138	1.1	319	15.4	323	0.5	306	0.5	1,774	0.6
31-45	2,554	43.1	25,824	2.7	25,933	4.5	301,426	8.7	1,071	51.7	3,974	6.1	4,240	6.9	35,280	12.1
46-54	971	16.4	50,702	5.2	51,239	9.0	410,041	11.8	369	17.8	8,650	13.2	8,595	14.0	63,189	21.7
55-64	694	11.7	124,905	12.9	120,977	21.2	695,856	20.1	190	9.2	18,499	28.3	17,934	29.3	96,951	33.3
65-75	387	6.5	765,213	78.9	369,720	64.7	2,007,609	57.9	35	1.7	33,807	51.8	30,054	49.1	93,372	32.1
Sex[d]																
Male	2,450	41.3	447,390	46.1	218,117	38.2	1,433,538	41.3	937	45.2	32,214	49.3	26,061	42.6	138,006	47.4
Female	3,481	58.7	522,677	53.9	352,896	61.8	2,033,621	58.7	1,136	54.8	33,113	50.7	35,121	57.4	152,898	52.6
Race and Ethnicity																
Non-Hispanic White	149	2.5	810,751	83.6	406,651	71.2	2,645,805	76.3	35	1.7	54,567	83.5	47,914	78.3	239,606	82.4
Black (African American)	5,469	92.2	81,511	8.4	98,884	17.3	458,625	13.2	1,940	93.6	6,182	9.5	8,313	13.6	28,844	9.9
Hispanic	133	2.2	40,136	4.1	45,432	8.0	220,616	6.4	39	1.9	2,509	3.8	3,175	5.2	13,976	4.8
Asian/Pacific Islander	17	0.3	10,747	1.1	7,771	1.4	48,878	1.4	*	*	469	0.7	433	0.7	1,702	0.6
AI/AN	*	*	4,223	0.4	3,833	0.7	31,117	0.9	*	*	463	0.7	533	0.9	2,929	1.0
Other	*	*	5,338	0.6	3,155	0.6	19,140	0.6	15	0.7	411	0.6	372	0.6	1,637	0.6
Unknown	113	1.9	17,361	1.8	5,287	0.9	42,978	1.2	33	1.6	726	1.1	442	0.7	2,210	0.8
Current Medicare Status																
Aged without ESRD	353	6.0	757,880	78.1	352,718	61.8	1,983,785	57.2	32	1.5	33,548	51.4	29,415	48.1	92,582	31.8
Aged with ESRD	34	0.6	7,333	0.8	17,002	3.0	23,824	0.7	*	*	259	0.4	639	1.0	790	0.3
Disabled without ESRD	5,263	88.7	195,892	20.2	177,612	31.1	1,402,644	40.5	1,981	95.6	30,952	47.4	29,575	48.3	194,451	66.8
Disabled with ESRD	233	3.9	7,168	0.7	19,366	3.4	44,663	1.3	51	2.5	456	0.7	1,269	2.1	2,431	0.8
ESRD only	48	0.8	1,794	0.2	4,315	0.8	12,243	0.4	*	*	112	0.2	284	0.5	650	0.2
Ever Dually Eligible (2016)																
Not Dual Eligible	926	15.6	730,504	75.3	276,310	48.4	1,962,295	56.6	294	14.2	37,378	57.2	26,734	43.7	134,949	46.4
Dual Eligible	5,005	84.4	239,563	24.7	294,703	51.6	1,504,864	43.4	1,779	85.8	27,949	42.8	34,448	56.3	155,955	53.6
Died during 2016																
Not Deceased	5,766	97.2	946,708	97.6	488,484	85.5	3,364,140	97.0	1,993	96.1	61,375	94.0	48,413	79.1	275,430	94.7
Deceased	165	2.8	23,359	2.4	82,529	14.5	103,019	3.0	80	3.9	3,952	6.0	12,769	20.9	15,474	5.3
Metropolitan/Rural[e]																
Metropolitan	5,218	88.0	759,361	78.3	446,212	78.1	2,533,226	73.1	1,894	91.4	50,904	77.9	48,926	80.0	217,224	74.7
Rural	713	12.0	210,705	21.7	124,801	21.9	933,931	26.9	179	8.6	14,423	22.1	12,256	20.0	73,679	25.3
Census Division																
New England	158	2.7	45,798	4.7	31,710	5.6	167,634	4.8	68	3.3	3,472	5.3	3,675	6.0	16,416	5.6
Middle Atlantic	712	12.0	114,790	11.8	55,586	9.7	336,830	9.7	307	14.8	8,343	12.8	6,750	11.0	34,003	11.7
East North Central	814	13.7	144,741	14.9	97,309	17.0	587,020	16.9	315	15.2	8,678	13.3	9,275	15.2	42,069	14.5
West North Central	249	4.2	63,949	6.6	30,406	5.3	271,788	7.8	94	4.5	4,247	6.5	3,418	5.6	20,844	7.2
South Atlantic	2,132	35.9	235,352	24.3	123,742	21.7	728,473	21.0	761	36.7	15,951	24.4	13,972	22.8	65,363	22.5
East South Central	645	10.9	81,409	8.4	52,339	9.2	355,199	10.2	155	7.5	5,150	7.9	4,821	7.9	26,328	9.1
West South Central	780	13.2	100,655	10.4	89,580	15.7	405,997	11.7	188	9.1	5,598	8.6	7,349	12.0	26,315	9.0
Mountain	88	1.5	64,970	6.7	29,707	5.2	217,042	6.3	39	1.9	4,711	7.2	4,349	7.1	21,463	7.4
Pacific	353	6.0	118,403	12.2	60,634	10.6	397,176	11.5	146	7.0	9,177	14.0	7,573	12.4	38,103	13.1

	Any Daily MME Regardless of Dosage								Average Daily MME ≥ 90							
	SCD		Cancer Only		Hospice Only		FFS General		SCD		Cancer Only		Hospice Only		FFS General	
	N	(%)[b]	N	(%)[b]	N	(%)[b]	N	(%)[b]	N	(%)[c]	N	(%)[c]	N	(%)[c]	N	(%)[c]
Comorbid Conditions																
COPD	674	11.4	170,639	17.6	199,431	34.9	538,268	15.5	234	11.3	16,999	26.0	23,968	39.2	57,667	19.8
Diabetes	920	15.5	311,478	32.1	284,767	49.9	1,140,544	32.9	239	11.5	20,277	31.0	26,658	43.6	84,818	29.2
CHF	1,118	18.9	126,748	13.1	205,517	36.0	417,239	12.0	425	20.5	10,177	15.6	20,383	33.3	34,881	12.0
Hip fracture	13	0.2192	2,769	0.3	14,149	2.5	8,173	0.2	*	*	288	0.4	1,287	2.1	702	0.2
Hypertension	2,452	41.3	654,168	67.4	463,728	81.2	2,119,973	61.1	788	38.0	40,448	61.9	44,607	72.9	154,799	53.2
Rheumatoid arthritis/ Osteoarthritis	1,460	24.6	473,674	48.8	379,033	66.4	1,674,485	48.3	494	23.8	37,596	57.6	41,599	68.0	170,780	58.7
Alcohol use disorder	309	5.2	37,172	3.8	46,592	8.2	163,157	4.7	109	5.3	3,745	5.7	5,369	8.8	16,268	5.6
Anxiety	1,520	25.6	240,083	24.7	246,871	43.2	989,057	28.5	645	31.1	26,086	39.9	32,708	53.5	117,226	40.3
Depression/Depressive Disorders	1,822	30.7	286,465	29.5	298,211	52.2	1,178,176	34.0	748	36.1	29,275	44.8	37,067	60.6	131,308	45.1
Fibromyalgia, Chronic Pain and Fatigue	3,449	58.2	356,431	36.7	291,046	51.0	1,419,256	40.9	1,569	75.7	47,361	72.5	46,286	75.7	219,132	75.3
Migraine	718	12.1	58,592	6.0	45,542	8.0	251,975	7.3	268	12.9	6,429	9.8	6,756	11.0	30,375	10.4
Total comorbidities																
0-1	2,159	36.4	245,147	25.3	55,350	9.7	856,550	24.7	619	29.9	8,840	13.5	6,985	11.4	43,376	14.9
2-3	2,184	36.8	414,409	42.7	144,645	25.3	1,433,861	41.4	836	40.3	22,870	35.0	10,472	17.1	105,473	36.3
4-5	1,178	19.9	232,652	24.0	194,696	34.1	875,428	25.2	469	22.6	22,160	33.9	18,802	30.7	98,300	33.8
6+	410	6.9	77,859	8.0	176,322	30.9	301,320	8.7	149	7.2	11,457	17.5	24,923	40.7	43,755	15.0
Had an NSAID script during observation period																
Had an NSAID script during observation period	2,331	39.3	314,154	32.4	206,318	36.1	1,356,687	39.1	732	35.3	20,315	31.1	20,800	34.0	106,009	36.4
Health Care Utilization																
Inpatient Visits (2015)																
No Utilization (No admissions)	2,311	39.0	780,452	80.5	338,647	59.3	2,869,578	82.8	588	28.4	47,256	72.3	33,491	54.7	230,825	79.3
Had an inpatient admission	3,620	61.1	189,615	19.5	232,366	40.7	597,581	17.3	1,485	71.6	18,071	27.7	27,691	45.3	60,079	20.7
1-3 admissions	2,340	64.6	178,591	94.2	197,074	84.8	560,893	93.9	827	55.7	16,329	90.4	22,579	81.5	55,504	92.4
4+ admissions	1,280	35.4	11,024	5.8	35,292	15.2	36,688	6.1	658	44.3	1,742	9.6	5,112	18.5	4,575	7.6
Outpatient Visits (Does not include ED) (2015)																
No Outpatient Visits	207	3.5	33,582	3.5	42,822	7.5	196,535	5.7	26	1.3	1,632	2.5	5,651	9.2	12,532	4.3
Had an Outpatient Visit	5,724	96.5	936,485	96.5	528,191	92.5	3,270,624	94.4	2,047	98.7	63,695	97.5	55,531	90.8	278,372	95.7
1-3 Outpatient Visits	566	9.9	53,551	5.7	31,836	6.0	332,021	10.2	129	6.3	2,302	3.6	2,576	4.6	16,217	5.8
4+ Outpatient Visits	5,158	90.1	882,934	94.3	496,355	94.0	2,938,603	89.8	1,918	93.7	61,393	96.4	52,955	95.4	262,155	94.2
Emergency department visits (2015)																
No Utilization (No ED visits)	1,106	18.6	630,988	65.0	252,042	44.1	2,115,682	61.0	321	15.5	34,943	53.5	24,704	40.4	162,724	55.9
Had an ED visit	4,825	81.3	339,079	35.0	318,971	55.9	1,351,477	39.0	1,752	84.5	30,384	46.5	36,478	59.6	128,180	44.1
1-3 ED visits	2,108	43.7	288,617	85.1	217,878	68.3	1,096,119	81.1	631	36.0	23,716	78.1	23,373	64.1	102,144	79.7
4+ ED visits	2,717	56.3	50,462	14.9	101,093	31.7	255,358	18.9	1,121	64.0	6,668	21.9	13,105	35.9	26,036	20.3

* Cells under 11 have been masked for privacy.

[a] Percentage of entire study population (SCD, Non-SCD Cancer, Non-SCD Hospice, and FFS General combined)

[b] Percentage of each sub-population.

[c] Percentage of subpopulation with at least one opioid prescription fill.

[d] N = 2 missing value for sex

[e] N = 12 missing value for rurality

Supplemental Table 5: Opioid Prescriptions among Medicare FFS Beneficiaries, by Population (using Average Daily MME ≥90 and ≥120)

Beneficiary Average Daily MME	Pop.	Total Bene-ficiaries	Number of Opioid Prescription Fills per Beneficiary (30-day Normed[a,b])						Number of Opioid Prescription Fills per Beneficiary						Days Supply per Prescription				
			Total Fills	Med	IQR[c]	Range	Avg	SD[d]	Total Fills	Med	IQR[c]	Range	Avg	SD[d]	Med	IQR[c]	Range	Avg	SD[d]
Any Daily MME	**SCD**	5,931	65,845	9.10	1.7-17.8	0.0-133.6	11.1	10.4	96,592	13	4-25	1-204	16.3	14.7	23	10-30	1-90	20.5	10.6
	Cancer Only	970,067	3,884,659	0.67	0.2-5.2	0.03-98.8	4.0	6.5	5,299,535	2	1-7	1-226	5.5	7.2	30	10-30	1-310	22.0	13.2
	Hospice Only	571,013	3,269,799	2.40	0.6-9.6	0.0-82.5	5.7	7.0	4,440,312	5	2-12	1-199	7.8	7.9	30	10-30	1-999	22.1	11.6
	FFS General	3,467,159	18,658,037	1.30	0.2-10.0	0.0-114.8	5.4	7.3	23,777,618	3	1-12	1-939	6.9	8.0	30	15-30	1-500	23.5	12.0
MME ≥90	**SCD**	2,073	43,907	21.67	14.4-26.1	0.0-133.6	21.2	9.5	59,267	27	21-34	1-204	28.6	15.7	30	14-30	1-90	22.2	9.9
	Cancer Only	65,327	1,096,492	17.33	9.0-26.0	0.0-98.8	16.8	11.0	1,235,935	20	10-27	1-203	18.9	12.8	30	28-30	1-150	26.6	8.8
	Hospice Only	61,182	949,362	15.20	6.0-24.7	0.1-78.6	15.5	10.6	1,091,010	18	7-26	1-199	17.8	12.3	30	28-30	1-350	26.1	8.8
	FFS General	290,904	5,414,156	20.23	12.8-26.0	0.0-114.0	18.6	10.1	5,973,423	23	13-28	1-939	20.5	12.0	30	28-30	1-365	27.2	7.9
MME ≥120	**SCD**	1,767	39,417	23.00	16.4-26.6	0.2-133.6	22.3	9.4	52,620	28	22-35	1-204	29.8	15.87	30	14-30	1-90	22.5	9.8
	Cancer Only	43,099	871,873	22.10	13.2-26.5	0.0-98.8	20.2	9.8	973,276	25	14-28	1-203	22.6	11.9	30	28-30	1-150	26.9	8.5
	Hospice Only	41,983	742,610	18.83	10.5-26.0	0.0-78.6	17.7	10.1	845,030	22	12-28	1-199	20.1	12.1	30	28-30	1-350	26.4	8.6
	FFS General	208,953	4,343,536	23.33	13.6-26.7	0.0-114.8	20.8	9.2	4,764,783	25	14-28	1-939	22.8	11.4	30	28-30	1-365	27.3	7.7

[a] Prescriptions are normed to a 30-day supply by dividing the days duration by 30.
[b] Summary statistics are presented to the second decimal place to reflect that they have been normalized to 30 days.
[c] IQR: Interquartile range.
[d] SD: Standard Deviation

Supplemental Table 6: Opioid Prescriptions among Medicare FFS Beneficiaries, by Chronicity (using Average Daily MME ≥90 and ≥120) and Population

				Number of Opioid Prescription Fills per Beneficiary						
Average Daily MME	**Study Group**	**Days Supply**	**Total Beneficiaries**	**Total Fills**	**% Fills within Subpopulation**	**Median**	**IQR**	**Range**	**Mean**	**Std Dev.**
Any Daily MME	**SCD**	**1-10 Days**	4,222	24,808	25.7	3	1-6	1-204	5.88	9.50
		11-20 Days	3,085	21,952	22.7	4	2-10	1-100	7.12	9.04
		≥20 Days	3,981	49,832	51.6	12	5-18	1-92	12.52	9.45
	Cancer Only	**1-10 Days**	705,570	1,460,055	27.6	1	1-2	1-226	2.07	2.91
		11-20 Days	217,942	664,600	12.5	1	1-3	1-92	3.05	4.00
		≥20 Days	384,529	3,174,880	59.9	6	2-13	1-97	8.26	7.47
	Hospice Only	**1-10 Days**	391,309	1,129,396	25.4	2	1-3	1-188	2.89	3.61
		11-20 Days	215,061	607,311	13.7	2	1-3	1-88	2.82	3.48
		≥20 Days	332,802	2,703,605	60.9	6	2-12	1-73	8.12	7.21
	FFS General	**1-10 Days**	2,208,300	5,019,779	21.1	1	1-2	1-939	2.27	3.56
		11-20 Days	787,186	2,651,599	11.2	2	1-4	1-132	3.37	4.57
		≥20 Days	1,709,428	16,106,240	67.7	9	3-13	1-112	9.42	7.65
90 MME or Greater	**SCD**	**1-10 Days**	1,292	10,811	18.2	4	2-9	1-204	8.37	14.15
		11-20 Days	1,351	13,882	23.4	7	2-13	1-100	10.28	11.82
		≥20 Days	1,913	34,574	58.3	17	12-25	1-92	18.07	9.62
	Cancer Only	**1-10 Days**	32,030	103,736	8.4	1	1-3	1-178	3.24	7.20
		11-20 Days	22,382	126,320	10.2	3	1-7	1-92	5.64	7.40
		≥20 Days	53,040	1,005,879	81.4	19	13-26	1-97	18.96	9.03
	Hospice Only	**1-10 Days**	33,419	111,004	10.2	2	1-3	1-188	3.32	6.29
		11-20 Days	24,745	110,488	10.1	2	1-5	1-88	4.47	6.10
		≥20 Days	51,004	869,518	79.7	16	11-25	1-73	17.05	9.24
	FFS General	**1-10 Days**	110,733	389,444	6.5	1	1-3	1-939	3.52	8.65
		11-20 Days	85,909	492,666	8.2	2	1-7	1-132	5.73	8.10
		≥20 Days	257,982	5,091,313	85.2	21	13-26	1-112	19.74	8.75
120 MME or Greater	**SCD**	**1-10 Days**	1,076	9,050	17.2	4	2-9	1-204	8.41	14.38
		11-20 Days	1,150	12,342	23.5	7	2-13	1-100	10.73	12.44
		≥20 Days	1,658	31,228	59.3	18	13-26	1-92	18.83	9.69
	Cancer Only	**1-10 Days**	17,843	72,103	7.4	2	1-3	1-178	4.04	8.72
		11-20 Days	16,498	98,679	10.1	3	1-8	1-92	5.98	7.84
		≥20 Days	40,212	802,494	82.5	21	13-26	1-97	19.96	9.10
	Hospice Only	**1-10 Days**	21,391	78,483	9.3	2	1-3	1-188	3.67	7.07
		11-20 Days	17,704	83,298	9.9	2	1-5	1-88	4.71	6.43
		≥20 Days	38,030	683,249	80.9	18	11-26	1-73	17.97	9.38
	FFS General	**1-10 Days**	69,340	283,724	6.0	2	1-3	1-939	4.09	9.94
		11-20 Days	65,286	389,122	8.2	2	1-7	1-132	5.96	8.44
		≥20 Days	199,424	4,091,937	85.9	22	13-27	1-112	20.52	8.83

Supplemental Table 7: Variables from CCW Databases

Item	Variable name- Label	Data Resource
SCD, Cancer, and Hospice Definitions		
SCD: ICD principle and secondary diagnosis codes	ICD_DGNS_CD1–ICD_DGNS_CD25 in institutional claims, ICD_DGNS_CD1–ICD_DGNS_CD25 in non-institutional claims	2012–2016 Inpatient and outpatient claims data
Non-SCD Cancer: ICD principle and secondary diagnosis codes	ICD_DGNS_CD1–ICD_DGNS_CD25 in institutional claims, ICD_DGNS_CD1–ICD_DGNS_CD25 in non-institutional claims AND Did not have SCD	2016 Inpatient and outpatient claims data
Non-SCD Hospice: Revenue center codes and revenue center HCFA common procedure coding system codes	REV_CNTR—Revenue center code HCPCS_CD—Revenue Center HCFA Common Procedure Coding System AND Did not have SCD	2016 Inpatient, outpatient, and hospice claims data
Beneficiary Demographics		
Age	BENE_AGE_AT_END_REF_YR—Age of beneficiary at end of year	2016 Master Beneficiary Summary File—Base (A/B/D)
Gender	BENE_SEX_IDENT_CD—Sex	2016 Master Beneficiary Summary File—Base (A/B/D)
Race and ethnicity	RTI_RACE_CD	2016 Master Beneficiary Summary File—Base (A/B/D)
Medicare status	MS_CD- Medicare Status Code	2016 Beneficiary Geographic Variations File
Dual eligibility status in 2016	DUAL_STUS_CD_01–DUAL_STUS_CD_12—Months of Dual Eligibility	2016 Master Beneficiary Summary File—Base (A/B/D)
Death status in 2016	BENE_DEATH_DT—Date of Death, BENE_VALID_DEATH_DT_SW— Valid Date of Death Switch	2016 Master Beneficiary Summary File—Base (A/B/D)
Census division	Recoded using STATE_CODE	2016 Master Beneficiary Summary File—Base (A/B/D)
State of residence	STATE_CODE—State code for beneficiary (SSA code)	2016 Master Beneficiary Summary File—Base (A/B/D)
Rural/Urban	CBSA_TYPE	2016 Beneficiary Geographic Variations File
Health Characteristics		
Chronic obstructive pulmonary disease	COPD—Chronic Obstructive Pulmonary Disease End-of-Year Indicator	2016 Master Beneficiary Summary File—Chronic conditions
Diabetes	DIABETES—Diabetes End-of-Year	2016 Master Beneficiary

Item	Variable name- Label	Data Resource
	Indicator	Summary File—Chronic conditions
Heart failure	CHF—Heart Failure End-of-Year Indicator	2016 Master Beneficiary Summary File—Chronic conditions
Hip or pelvic fracture	HFRAC—End-of-Year Flag	2016 Master Beneficiary Summary File—Chronic Conditions
Hypertension	HYPERT—End-of-Year Flag	2016 Master Beneficiary Summary File—Chronic Conditions
Rheumatoid arthritis or osteoarthritis	RAOA—End-of-Year Flag	2016 Master Beneficiary Summary File—Chronic Conditions
Alcohol use disorders	ALCO—End-of-Year Flag	2016 Master Beneficiary Summary File—Chronic Conditions
Anxiety disorders	ANXI—End-of-Year Flag	2016 Master Beneficiary Summary File—Chronic Conditions
Depressive disorders	DEPSN—End-of-Year Flag	2016 Master Beneficiary Summary File—Chronic Conditions
Fibromyalgia, chronic pain and fatigue	FIBRO—End-of-Year Flag	2016 Master Beneficiary Summary File—Chronic Conditions
Migraine and chronic headache	MIGRAINE—End-of-Year Flag	2016 Master Beneficiary Summary File—Chronic Conditions
Medication Utilization		
Opioid prescription	PROD_SRVC_ID—Product Service ID (the National Drug Code [NDC]), GNN — Generic Drug Name, QTY_DSPNSD_NUM—Quantity Dispensed, DAYS_SUPLY_NUM—Days Supply, FILL_NUM—Fill Number	2016 Part D drug event file
Nonsteroidal anti-inflammatory drug	PROD_SRVC_ID—Product Service ID (the National Drug Code [NDC]), GNN—Generic Drug Name	2016 Part D drug event file
Heath Care Utilization		
Inpatient admissions	CLM_FROM_DT, CLM_THRU_DT, Provider Number, Claim Facility Type Code	2016 institutional claims data-inpatient claims file
Outpatient clinic visits	CLM_FROM_DT, CLM_THRU_DT, Provider Number, Claim Facility Type Code	2016 institutional claims data-outpatient claims file
Emergency department visits	REV_CNTR—Revenue center code	2016 institutional claims data-inpatient and outpatient claims files