

Emergency Providers' Opioid Prescribing Behaviors Among Medicare Part D Beneficiaries in North Carolina, 2013-2014: Medication Utilization and Costs

Brittany Williams, Geoffrey Mospan, Rebecca Seabock, Chris Gillette, Michelle DeGeeter

BACKGROUND This study sought to quantify utilization and costs associated with opioid prescribing by emergency providers for Medicare Part D beneficiaries in North Carolina and the United States from 2013 to 2014.

METHODS This was a retrospective examination of the Medicare Provider Utilization and Payment Data: Part D Prescriber datasets from 2013-2014. The main variables of interest were total number of prescription claims and total Medicare Part D medication costs for opioid analgesic medications. Generalized estimating equations were used to analyze the data.

RESULTS Excluding North Carolina, there were 2,030,108 (678.49 per 100,000) opioid claims in the United States in 2013, costing more than \$28.3 million. In 2014, also excluding North Carolina, there were 2,061,992 (689.15 per 100,000) claims for opioids, costing almost \$35.8 million. In North Carolina, there were 67,570 (708.62 per 100,000) opioid claims from emergency providers in 2013 and 72,881 (764.31 per 100,000) opioid claims in 2014 for Part D beneficiaries. Total Part D drug costs associated with opioids from North Carolina increased from \$545,574 to \$764,016, more than a 40% increase. In North Carolina, there was a statistically significant increase in costs ($P < .001$), but not a significant increase in numbers of claims ($P = .051$).

LIMITATIONS This study did not examine patient-level data and could not examine diagnoses leading to opioid prescriptions, or opioid misuse or overdoses.

CONCLUSION Almost 1 out of every 4 Part D prescriptions from emergency department providers in North Carolina was for an opioid medication. Given the recent focus on controlling opioid prescribing, future research should examine if the new opioid-prescribing guidelines reduced opioid prescription by these providers.

Prescription opioid abuse and addiction are serious public health problems in the United States [1]. Opiates are a class of medications that act on receptors within the central nervous system to help relieve pain, and are commonly prescribed. It is estimated that 1 in 5 Americans is treated with opioids for non-cancer pain symptoms and related diagnoses, and that more than 2 million Americans misuse prescription opioid medications [2, 3]. In 2012, enough prescriptions for opioids were written by medical providers that each adult in the United States could have a bottle [2]. Although used for treatment of acute and chronic pain, opioids pose serious risks, including dependence and overdose. Chronic use of opioids has also been found to adversely impact the gastrointestinal system, respiratory system, cardiovascular system, endocrine system, and central nervous system [4].

According to the Centers for Disease Control and Prevention (CDC), the United States is currently experiencing an opioid overdose epidemic. More than 28,000 Americans died from an opioid overdose in 2014, and at least half of all opioid overdose deaths involved prescription opioids. In North Carolina alone, there were 1,567 deaths from drug overdoses in 2015, a 15% increase from 2014 [5, 6]. According to the CDC, North Carolina is among the states with the highest opioid utilization in the United

States [5]. The increase in overdose deaths may be related to an increase in opioid prescriptions, or to an increase in the number of opioid tablets provided per prescription. Previous research has found that emergency providers differ in opioid prescribing, with some prescribing more than others [7, 8]. Opioid-naïve patients who receive a prescription from a high-intensity opioid emergency provider are more likely to develop long-term opioid use than those who receive their first opioid prescription from a low-intensity opioid prescriber [8]. Therefore, it is critical to describe emergency providers' opioid-prescribing behavior and critically examine it in order to develop methods to improve opioid utilization.

Medicare represents one of the largest payers for medications in the United States, accounting for almost 29% of total US drug spending in 2014 [9]. To our knowledge, there has not been a study that has quantified the utilization and costs to Medicare Part D of opioid prescriptions associated

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Address correspondence to Dr. Chris Gillette, Wingate University School of Pharmacy, 515 N Main St, Wingate, NC 28174 (c.gillette@wingate.edu).

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with emergency department physicians. The purpose of this study was to quantify utilization and costs associated with opioid prescribing by emergency department providers for patients with Medicare Part D coverage in North Carolina and the United States from 2013 to 2014.

Methods

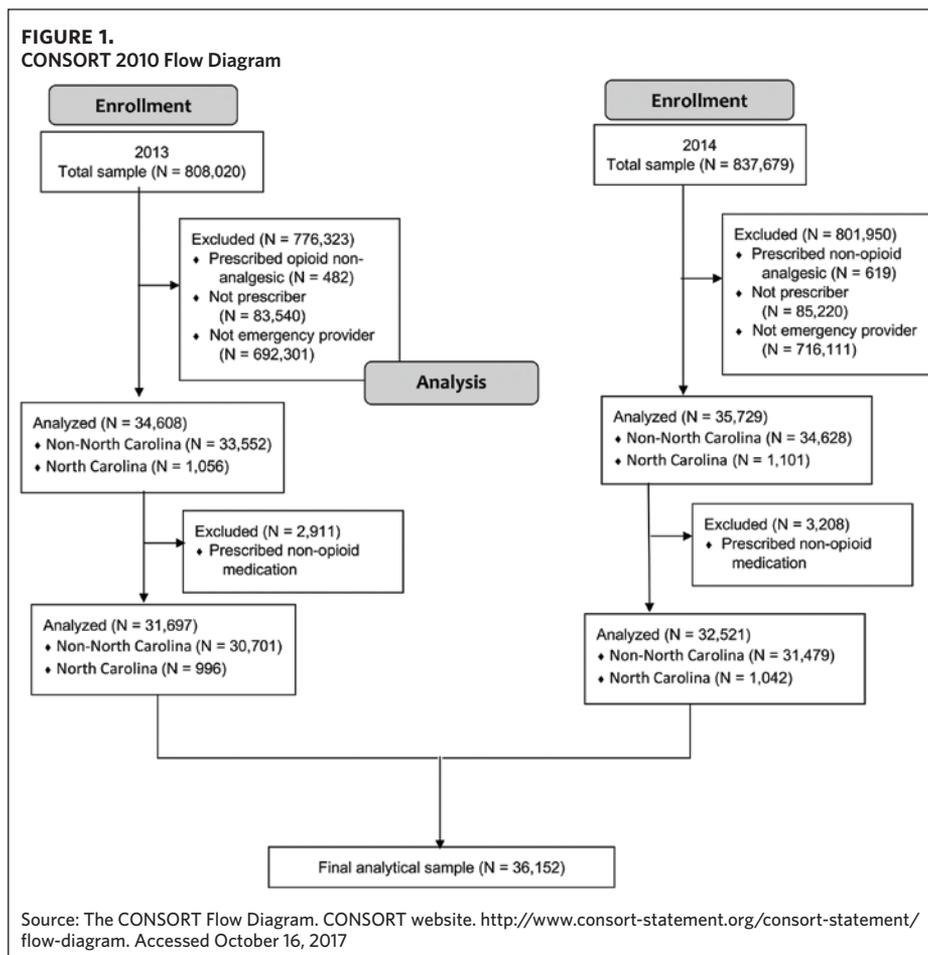
Overview

This retrospective study was approved by the Wingate University Research Review Board. This study used data from the Medicare Provider Utilization and Payment Data: Part D Prescriber Public Use File for 2013–2014. These data contain information on all prescription drugs prescribed by physicians and other health care providers that are paid for through Medicare Part D, including traditional Medicare Part D and Medicare Advantage. The data include the following national provider-level prescribing information for each drug: the brand name, the generic name, the number of Medicare beneficiaries that were prescribed opioids, the number of Medicare Part D claims (including refills), the total number of days' supply for all claims, and the aggregate cost paid for all claims. The total drug cost includes the ingredient cost of the medication, any dispensing fees, sales tax, and administration fees. The amount is based on what

is paid by the Part D plan, the patient, government subsidies, and any other third-party payers. The claims include information only on Medicare Part D enrollees, which is approximately two-thirds of Medicare beneficiaries. More information on the methodology on these data can be found through the Centers for Medicare and Medicaid Services (CMS) website [10].

Participants

Figure 1 presents the CONSORT diagram of the analytic sample. The full 2013 dataset contained 808,020 unique provider identification numbers and the full 2014 dataset contained 837,679 unique provider identification numbers. First, we excluded all opioid non-analgesic drugs (eg, cough and opioid antagonists) (2013, N = 807,538; 2014, N = 837,060). Next, we identified all providers with prescribing authority (eg, general practice, family practice, or physician assistant) using the provider's national provider identifier (NPI) (2013, N = 723,998; 2014, N = 751,840). After identifying all prescribers in the dataset, we further restricted inclusion in the study to only emergency providers throughout the country, including North Carolina. We analyzed data from the full emergency provider sample (with all drugs) to describe the prevalence of opioids in Part



D (2013 N = 31,697; 2014 N = 35,729). The final analytical dataset selected only emergency providers who wrote prescriptions for opioid medications in 2013 (N = 31,697) and 2014 (N = 32,521). The unit of analysis was the provider and drug. We then merged the 2013 and 2014 datasets for the final analytical dataset, which contained 36,152 unique NPI numbers.

Measurement

Each provider's state of practice was provided in the dataset. State of practice was dichotomized, North Carolina (1) versus non-North Carolina (0). Next, prescribed drugs were dichotomized into opioid analgesic (yes = 1) or non-opioid medications (no = 0). Opioid antagonists and opioid cough medications were excluded from this analysis to prevent errors in identifying pain medications. Provider specialty was dichotomized to emergency department (1) and other (0). The day supply variable was reported in aggregate by physician and drug in the Medicare dataset. We identified the year associated with each record as 2013 (0) or 2014 (1). United States and North Carolina population data were obtained from the United States Census Bureau and the 2010 Census [11].

Analysis

All analyses were conducted in SAS v9.3 (Cary, NC). First, we present descriptive statistics of opioid and non-opioid medications prescribed by all emergency providers in the United States, excluding North Carolina, including total numbers of claims for each drug and total drug costs for each drug in 2013 and 2014. We also presented the same statistics for North Carolina only. Next, we created 2 multivariable generalized estimating equation (GEE) models to examine the influence of location (North Carolina versus non-North Carolina) and year (2014 versus 2013) on claims (using Poisson distribution and logarithmic link function) and Part D costs (using Gamma distribution and logarithmic link function). Finally, we created 2 GEE models for claims (Poisson distribution) and costs (gamma distribution) only for North Carolina providers to examine change in claims and costs. All GEE models were clustered by provider. An alpha level less than or equal to .05 indicated statistical significance.

Results

2013 Opioid Utilization and Cost

Opioid utilization and costs for 2013 and 2014 are presented in Table 1. Excluding North Carolina, a total of 12,366,921 prescriptions were written by emergency providers for 1,509,168 beneficiaries during the study period. There were 2,030,108 claims (678.49 per 100,000) for opioids from emergency providers (16.42% of all claims), costing Medicare Part D more than \$28 million. In North Carolina, there were 272,415 prescriptions written by emergency providers for 59,498 beneficiaries. There were 67,570 claims

(708.62 per 100,000) for opioids from emergency providers (24.80% of all claims), costing Medicare Part D approximately \$545,574. The most commonly prescribed opioids for 2013 in both the United States and North Carolina were hydrocodone with acetaminophen and oxycodone with acetaminophen.

2014 Opioid Utilization and Cost

Excluding North Carolina, in 2014 there were 12,142,677 prescriptions from emergency providers for 1,591,295 beneficiaries. 2,061,992 claims (16.98% of all claims, 689.15 per 100,000) for opioid medications were written by emergency providers, totaling almost \$35.8 million. In North Carolina, there were 298,107 total claims from emergency providers for 63,929 beneficiaries. Of these, there were 72,881 claims for opioid medications (24.45% of all claims, 764.31 per 100,000), costing Medicare Part D more than \$716,000. Similar to 2013, the 2 most common opioid medications prescribed in 2014 were hydrocodone with acetaminophen and oxycodone with acetaminophen.

Table 2 presents the multivariable GEE results examining total opioid claims and costs. There was not a significant difference among North Carolina and non-North Carolina providers in total opioid claims ($\beta = -.008, P = .638$), nor was there a difference in 2014 compared to 2013 ($\beta = .002, P = .726$). The GEE results examining total opioid costs found that North Carolina providers had significantly lower costs than non-North Carolina providers ($\beta = -.221, P < .0001$) and that opioid costs significantly increased in 2014 compared to 2013 ($\beta = .535, P < .0001$).

Table 2 also presents the multivariable GEE results for claims and Part D costs in North Carolina. In North Carolina, there was not a statistically significant difference in opioid claims in 2014 compared to 2013 ($\beta = .036, P = .051$); however, there was a statistically significant increase in opioid costs to Part D in North Carolina from 2013 to 2014 ($\beta = .316, P < .001$).

Discussion

Prescription opioids comprise a large amount of emergency providers' prescribing nationally, as well as in North Carolina. Previous research has shown that from the mid-1990s, prescription opioid sales have increased, as have the numbers of Americans dying from opioid drug overdoses [12]. This study found that almost 1 out of every 4 prescriptions reimbursed by Medicare Part D from North Carolina emergency department providers involved an opioid analgesic in 2013 and 2014. This study also found that the most common opioid analgesics prescribed in the United States and North Carolina were hydrocodone with acetaminophen and oxycodone with acetaminophen.

The costs to Medicare Part D nationally for opioid analgesics increased from \$29.7 billion to approximately \$35 billion (approximately 19%) in 1 year. In North Carolina, costs to Medicare Part D for opioids increased more than

TABLE 1.
Emergency Provider Opioid Prescribing in the United States and North Carolina, 2013-2014

Drug name	2013 total number of claims (US)	2014 total number of claims (US)	2013 total drug costs (US)	2014 total drug costs (US)	2013 total number of claims (NC)	2014 total number of claims (NC)	2013 total drug costs (NC)	2014 total drug costs (NC)
C-II								
Hydrocodone/APAP	1,275,826.00	1,216,255.00	10,365,565.43	11,379,413.32	36,870.00	39,001.00	222,139.47	299,054.23
Hydrocodone/Ibuprofen	5,076.00	4,161.00	96,130.07	69,202.07	121.00	28.00	1,173.58	180.59
Oxycodone	65,070.00	72,589.00	7,398,718.95	7,376,261.96	1,454.00	2,446.00	72,271.70	120,214.28
Oxycodone/APAP	297,020.00	348,744.00	2,958,841.30	5,466,310.38	17,419.00	19,205.00	116,876.31	213,983.99
Oxycodone/ASA	11.00	11.00	1,051.63	1,019.59	-	-	-	-
Oxymorphone	2,062.00	2,998.00	946,569.82	1,402,418.78	11.00	26.00	6,554.90	15,141.71
Hydromorphone	9,449.00	9,217.00	457,791.62	335,268.42	257.00	242.00	1,391.14	2,121.04
Morphine	24,086.00	21,005.00	1,543,250.51	2,080,321.26	179.00	214.00	11,339.69	19,184.53
Fentanyl	20,615.00	19,624.00	3,337,884.14	4,099,077.42	357.00	303.00	52,085.34	35,738.29
Meperidine	108.00	107.00	3,315.97	5,392.81	11.00	-	305.61	-
Methadone	10,414.00	8,453.00	170,719.31	140,344.67	117.00	116.00	1,630.85	1,804.38
Tapentadol	320.00	372.00	79,213.70	95,269.53	12.00	12.00	424.05	4,881.51
C-III								
APAP/Codeine	49,080.00	56,642.00	354,151.69	359,517.18	991.00	719.00	6,753.77	3,908.23
Buprenorphine	378.00	680.00	106,904.82	204,954.51	-	-	-	-
Butalbital/APAP/Caff/Codeine	331.00	177.00	12,513.29	9,966.59	-	11.00	-	371.92
Codeine/Butalbital/ASA/Caff	126.00	65.00	8,782.12	6,426.73	23.00	12.00	590.54	417.24
Dihydrocodeine/APAP/Caff	24.00	-	2,230.72	-	-	-	-	-
C-IV								
Butorphanol	340.00	278.00	19,097.49	17,461.69	-	-	-	-
Pentazocine/APAP	12.00	-	1,005.12	-	-	-	-	-
Pentazocine/Naloxone	162.00	68.00	11,857.37	4,514.96	-	-	-	-
Tramadol	257,149.00	289,574.00	1,678,908.08	1,602,448.67	9,473.00	10,344.00	47,944.89	45,070.76
Tramadol/APAP	12,416.00	10,883.00	191,828.11	131,126.30	275.00	202.00	4,092.00	1,943.62
Other								
Nalbuphine	33.00	89.00	2,136.12	13,150.93	-	-	-	-
Total	2,030,108	2,061,992	29,748,467.38	34,799,867.77	67,570	72,881	545,573.84	764,016.32

Note. C-II, Schedule II; C-III, Schedule III; C-IV, Schedule IV; NC, North Carolina; US, United States.

40% from 2013 to 2014, which was statistically significant even though the number of opioid prescriptions was not significantly higher in 2014 compared to 2013. Other researchers have found that the cost of prescription medications increased more than 10% from 2013 to 2014, even affecting older drugs and drugs available as generics [13, 14]. The rise in prescription medication costs slowed from 2014 to 2015, increasing 8.5%, according to IMS Health [15]. Even though

drug prices have continued to increase yearly, it seems that opioid medications' price increases may be outpacing other prescription medications. Restricting the use of these medications may go a long way toward reducing the effect of opioid prices on the Medicare Part D budget. From 2013 to 2014, the 2 most commonly prescribed medications, hydrocodone with acetaminophen and oxycodone with acetaminophen, had cost increases that far outpaced the change in the

TABLE 2.
Multivariable Generalized Estimating Equation Models
Examining Opioid Claims and Costs in Medicare Part D

Independent variable	Dependent variable			
	Opioid claims-beta (P value)	Opioid costs-beta (P value)	NC opioid claims-beta (P value)	NC opioid costs-beta (P value)
NC (yes)	-0.008 (P = 0.638)	-0.221 (P < .0001)	-	-
2014 (yes)	0.002 (P = .726)	0.535 (P < .0001)	0.036 (P = .051)	0.316 (P < .001)

Note. NC, North Carolina.

number of claims. Involving pharmacists in the selection of pain medications for patients in the emergency department may go a long way to ensure the appropriate use of these drugs.

The CDC, together with multiple government public health agencies, compiled common elements of opioid-prescribing guidelines that were made prior to 2013 and found that all 8 guidelines recommended that opioid therapy be initiated if non-opioid treatments were ineffective [16]. More research needs to be conducted to examine whether emergency physicians used other non-opioid treatments for pain prior to beginning opioid therapy. Further, the Institute for Clinical Systems Improvement recommends that providers use shared decision-making when treating pain and provide pain education [17].

Limitations

This study has limitations that may influence its findings. First, this study used data aggregated at the physician and medication level and is unable to examine patient-level data to examine diagnoses leading to opioid prescriptions, the number of patients documented with substance abuse diagnoses, or overdoses. It was also unable to determine how many patients were opiate naïve, or if they had received previous prescriptions for opiates prior to the emergency department visit. Further, this study only focused on patients enrolled in Medicare Part D and Medicare Advantage plans with a drug benefit and therefore is not a national representation of the entire Medicare population. However, according to CMS, this dataset covers approximately 75% of all covered Medicare beneficiaries [10]. Further, it is unknown from this dataset whether these providers followed any opioid guidelines when prescribing, as well as how emergency providers ensured follow-up with a patient's primary care provider.

Conclusion

Despite the limitations of not having access to patient-level data, this study shows the impact of opioid medication utilization and costs to society in Medicare Part D patients in North Carolina and nationally. Future research should

investigate opioid prescribing patterns in other settings for Medicare beneficiaries as well as the continued evaluation of appropriate prescribing. Knowing the prescribing behaviors and costs is a good place to start to determine next steps in better controlling opioid prescribing, especially by emergency department providers. NCMJ

Brittany Williams, PharmD clinical pharmacy resident, Catawba Valley Medical Center, Hickory, North Carolina.

Geoffrey Mospan, PharmD, BCPS assistant professor, Wingate University School of Pharmacy, Wingate, North Carolina.

Rebecca Seabock PharmD candidate, Wingate University School of Pharmacy, Wingate, North Carolina.

Chris Gillette, PhD assistant professor, Wingate University School of Pharmacy, Wingate, North Carolina.

Michelle DeGeeter, PharmD, CDE associate professor, Wingate University School of Pharmacy, Wingate, North Carolina.

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References

1. Volkow ND. America's Addiction to Opioids: Heroin and Prescription Drug Abuse. National Institute on Drug Abuse website. <https://www.drugabuse.gov/about-nida/legislative-activities/testimony-to-congress/2016/americas-addiction-to-opioids-heroin-prescription-drug-abuse>. Published May 14, 2014. Accessed March 1, 2017.
2. Dowell D, Haegerich TM, Chou R. CDC guideline for prescribing opioids for chronic pain-United States, 2016. *MMWR*. 2016;65(1):1-49.
3. American Society of Addiction Medicine. Opioid Addiction 2016 Facts & Figures. 2016. <https://www.asam.org/docs/default-source/advocacy/opioid-addiction-disease-facts-figures.pdf>. Accessed October 16, 2017.
4. Baldini A, Korff MV, Lin EHB. A review of potential adverse effects of long-term opioid therapy: a practitioner's guide. *Prim Care Companion CNS Disord*. 2012;14(3).
5. Centers for Disease Control and Prevention. Prescribing Data. CDC website. <https://www.cdc.gov/drugoverdose/data/prescribing.html>. Published December 20, 2016. Updated August 30, 2017. Accessed October 16, 2017.
6. Centers for Disease Control and Prevention. Drug Overdose Death Data. CDC website. <https://www.cdc.gov/drugoverdose/data/statedeaths.html>. Updated December 16, 2016. Accessed October 16, 2017.
7. Varney SM, Bebart VS, Mannina LM, et al. Emergency medicine providers' opioid prescribing practices stratified by gender, age, and years in practice. *World J Emerg Med*. 2016;7(2):106-110.
8. Barnett ML, Olenski AR, Jena AB. Opioid-prescribing patterns of emergency physicians and risk of long-term use. *N Engl J Med*. 2017;376(7):663-673.
9. 10 Essential Facts About Medicare and Prescription Drug Spending. Henry J. Kaiser Family Foundation website. <http://kff.org/infographic/10-essential-facts-about-medicare-and-prescription-drug-spending/>. Published July 7, 2016. Accessed Nov 14, 2016.
10. Centers for Medicare and Medicaid Services. Medicare Provider Utilization and Payment Data: Part D Prescriber. CMS website. <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Provider-Charge-Data/Part-D-Prescriber.html>. Updated August 18, 2016. Accessed November 15, 2016.
11. Quick Facts. United States Census Bureau website. <https://www.census.gov/quickfacts/table/PO010210/37,00>. Accessed May 23, 2017.
12. Modarai F, Mack F, Hicks P, et al. Relationship of opioid prescription sales and overdoses, North Carolina. *Drug Alcohol Depend*. 2013;132(1-2):81-86.
13. What are the recent and forecasted trends in prescription drug spending? The Henry J. Kaiser Family Foundation website. <http://>

- kff.org/slideshow/what-are-the-recent-and-forecasted-trends-in-prescription-drug-spending/. Accessed March 8, 2017.
14. Schumock GT, Vermeulen LC. The rising cost of prescription drugs: causes and solutions. *Pharmacotherapy*. 2017;37(1):9-11.
 15. Constantino T. IMS Health study: US drug spending growth reaches 8.5% in 2015. QuintilesIMS website. <http://www.imshealth.com/en/about-us/news/ims-health-study-us-drug-spending-growth-reaches-8.5-percent-in-2015>. Published April 14, 2016. Accessed March 8, 2017.
 16. Centers for Disease Control and Prevention. Common Elements in Guidelines for Prescribing Opioids for Chronic Pain. Atlanta, GA: Centers for Disease Control and Prevention. http://www.cdc.gov/drugoverdose/pdf/common_elements_in_guidelines_for_prescribing_opioids-a.pdf. Accessed March 2, 2017.
 17. Hooten M, Thorson D, Bianco J, et al. Pain: Assessment, Non-Opioid Treatment Approaches and Opioid Management. Guideline Summary. Institute for Clinical Systems Improvement website. https://www.icsi.org/guidelines__more/catalog_guidelines_and_more/catalog_guidelines/catalog_neurological_guidelines/pain/. Revised August 2017. Accessed October 18, 2017.