Characteristics of Hydroxychloroquine Dispensing in the United States, January to May 2020

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BACKGROUND

During the first months of the COVID-19 pandemic, hydroxychloroquine (HCQ) was promoted by public figures as an effective treatment despite inconclusive evidence, the potential for side effects, and subsequent shortages of this medication.[1]

OBJECTIVE

To describe trends in HCQ dispensing in the early months of the pandemic.

METHODS AND FINDINGS

We identified all HCQ dispensings from January 1, 2020, to May 31, 2020, from the OptumLabs® Data Warehouse,[2] which contains longitudinal, de-identified pharmacy and medical claims for commercial or Medicare Advantage enrollees. We required at least 180 days of prior insurance enrollment to establish a look-back period for the first fill. Enrollees with no fills in this window were classified as "new fillers," while those with prior fills were classified as "previous fillers." We constructed a fill rate as the 7-day moving average per 1000 total insurance enrollees in the month of the fill date.

We looked back 180 days from each enrollee's first 2020 fill date for a clinical encounter with an ICD-9/ICD-10 diagnosis of lupus, rheumatoid arthritis (RA), malaria, or Sjogren's syndrome to determine whether enrollees had an indication for HCQ use.[3] Dispensings for individuals with none of these diagnoses were considered non-indicated.

To determine whether the new fills were associated with a clinician visit (including telemedicine), we looked for any evaluation and management code, irrespective of the diagnosis code, in the 2 weeks prior to the fill.

We identified 66,523 enrollees with 134,417 HCQ fills (Table 1) during the study period; 28.8% of these enrollees had no previous use of HCQ. Our sample was predominantly female, and among indicated users, the most common diagnosis was RA. Nearly 13,000 new fillers (67.2%) did not have indication; among previous fillers, 15.1% had no indication. The sample of new fillers without an indication was unlike both new fillers with an indication and previous fillers, with fewer women and Medicare Advantage enrollees. These findings were robust to a sensitivity analysis using a 365-day look-back period (among those with 365 days prior enrollment, 27.9% of fillers had no previous HCQ use; 67.1% of new and 15.0% of previous fillers had no indication). COVID-19 diagnosis status was examined independently of standard indications for HCQ. A suspected or confirmed COVID-19 diagnoses was found in 11.0% of non-indicated fills and 2.5% of otherwise indicated fills.

The rate of HCQ fills per 1000 enrollees increased substantially in mid-March among both new and previous HCQ fillers (Fig. 1). The percent of HCQ fills associated with a recent clinician's visit also experienced significant volatility coinciding with COVID-19. In February, 41.5% of new HCQ fillers and 73.5% of prior HCQ fillers had a clinician visit in the 2 weeks prior to dispensing. During the first 2 weeks of March, 40.1% of prior fillers had a clinician visit, dropping to 35.9% during the following 2 weeks. For new fillers, however, this percentage dropped dramatically from 71.3 to 31.3%.

DISCUSSION

Our results provide a picture of HCQ prescribing that is consistent with concerning use of this medication for COVID-19, as most new fillers had no documented HCQ indication and did not have a clinician's visit 2 weeks before the dispensing. Our results suggest that HCQ may have been initiated without full examination and screening for potential

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Table 1 Summary Statistics of Sample of Fills for Hydroxychloroquine (January 1 – May 31, 2020)

	Previous Fillers		New Fillers	
	Not Indicated	Indicated	Not Indicated	Indicated
Number of Unique Enrollees	7,153	40,236	12,851	6,283
Total Number of Fills	16,673	98,610		
Percent Covered by Medicare Advantage	46.3%	53.4%	34.4%	48.9%
Female	76.2%	84.7%	54.8%	81.9%
Average Age	60.0	61.0	56.8	59.2
E&M Previous 14 Days[1]	31.3%	37.7%	34.1%	71.4%
Average Days Supplied	46.0	51.5	19.2	38.8
Lupus[2]	-	35.6%	-	25.1%
Rheumatoid Arthritis[3]	-	61.8%	-	57.3%
Sjogren's Syndrome[4]	-	27.9%	-	33.3%
Other Indicated (Malaria, Connective Tissue Diseases)[5]	-	11.3%	-	10.2%
COVID-19[6]	0.0%	0.0%	11.0%	2.5%

[1]*Evaluation & Management procedure codes: 99201-99205, 99211-99215, 99241-99245, 99221-99223, 99231-99233, 99441-99443, G0406-G0408, G0425-G0427*
[2]*ICD-10: M32.x, L93.x; ICD-9: 710.1x*
[3]*ICD-10: M05.x, M06.x; ICD-9: 714.0, 714.3x*
[4]*ICD-10: M35.0x, H04.123; ICD-9: 710.2x, 375.15*
[5]*ICD-10: M35.8x, M35.9, M36.8, B50.x-B54.x; ICD-9: 710.5, 710.8, 710.9, 084.x*
[6]*ICD-10: U07.1, U07.2*

interactions or side effects.[4] We also observed a spike in fills by people with a history of HCQ use, consistent with fear of a drug shortage caused by COVID-19-associated demand for HCQ.[5] Our study is limited by our inability to observe whether HCQ supply may have limited the number of fills during this period.

While the mid-March spike in HCQ was concerning, the number of new fillers dropped quickly by early May, suggesting a response to further information on the lack of benefits from (and potential risks of) HCQ.[6] Our results provide evidence of strong uptake of medication usage during times of uncertainty.

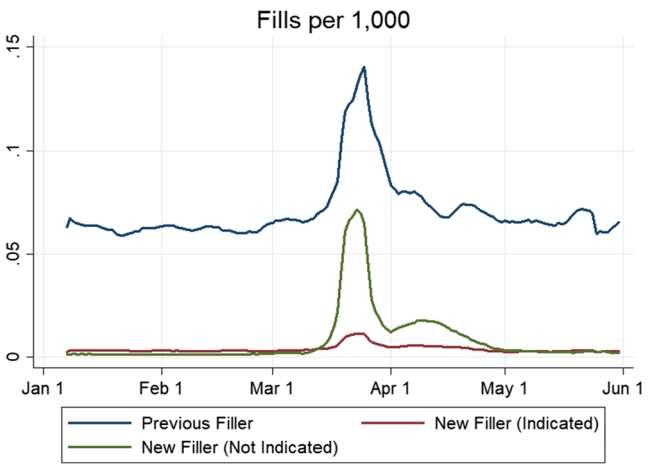

Figure 1 Rolling 7-day average daily hydroxychloroquine prescription dispensings from January 1 to May 31, 2020.

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Declarations:

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work. Dr. Jeffery reports funding from AHRQ (this grant) and from the American Cancer Society, the National Institute on Drug Abuse, the National Heart, Lung, and Blood Institute, and the US Food and Drug Administration for unrelated work. Dr. Duarte Garcia reports funding from the Centers for Disease Control and Prevention and from the Rheumatology Research Foundation. Mr. Levin and Ms. Chang are graduate students in the Division of Health Policy and Management, University of Minnesota School of Public Health. Ms. Chang is also an employee at the Health Care Cost Institute for work unrelated to this manuscript.

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