Impact of COVID-19 on health care resource utilization and costs in patients with chronic obstructive pulmonary disease and asthma in the United States (2018–2022): A population-based study

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Conclusions

- This retrospective, population-level study describes the impact of COVID-19 on clinical and economic burden as well as disease management among patients with COPD or asthma
- Apparent decreases in HCRU (notably hospitalizations and emergency care) were observed during the early stages of the pandemic
- Following an initial dramatic increase, telemedicine utilization has remained elevated compared to the pre-pandemic period, suggesting that telemedicine has become an important means for accessing healthcare among patients with asthma and COPD
- Consistent with trends observed in HCRU, all-cause and disease-related total healthcare costs decreased in April 2020 and appeared to gradually increase thereafter
- These results may inform future observational studies that include pandemic-era data

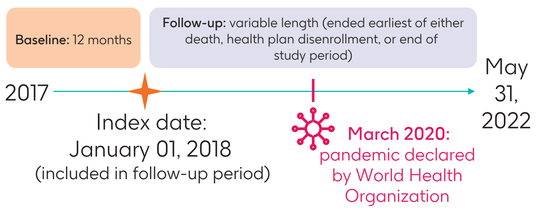
Introduction

- Impact of COVID-19 is expected to be significant and long lasting, especially among patients with chronic respiratory diseases such as asthma and COPD[1]
- Healthcare provision was disrupted during the COVID-19 pandemic, particularly during the early phases, resulting in a substantial impact on hospital and emergency admissions, and increased reliance on telemedicine[2–6]
- Up-to-date data on the healthcare resource and economic impact of the COVID-19 pandemic on patients with COPD and asthma is needed
- Objective of this study was to describe changes in HCRU and costs for patients with COPD and asthma in the US before and during the COVID-19 pandemic

Methods

- This retrospective, longitudinal cohort study used the US claims data from the Optum Research Database to identify patients with continuous enrollment in the prior calendar year (baseline period) as follows (**Figure 1**):
  - Asthma: aged ≥18 years with ≥2 medical claims for asthma diagnosis
  - COPD: aged ≥40 years with ≥2 medical claims for COPD diagnosis

Figure 1: **Study design**



- Overall (all-cause), COPD-related, and asthma-related HCRU and total healthcare costs (pharmacy and medical) were captured
  - HCRU included physician office visits, hospital outpatient visits, telemedicine visits, ER visits, urgent care visits, "other" (non-inpatient) visits, and inpatient hospitalizations
  - Costs adjusted using the 2021 CPI
- All analyses were descriptive

Results

Patient demographics are shown in **Table 1**

Table 1: **Baseline demographic and clinical characteristics**

	COPD population (N=139,128)	Asthma population (N=143,053)
Age, years, mean (SD)	71.8 (9.8)	59.8 (17.2)
Female sex, n (%)	81,005 (58.2)	99,292 (69.4)
Race/ethnicity, n (%)		
White/Caucasian	70,098 (50.4)	70,789 (49.5)
Black/African American	14,089 (10.1)	14,344 (10.0)
Hispanic	6222 (4.5)	9714 (6.8)
Asian	1209 (0.9)	2657 (1.9)
Unknown/other	47,510 (34.2)	45,549 (31.8)
Region, n (%)		
Northeast	19,130 (13.8)	18,467 (12.9)
Midwest	35,795 (25.7)	36,099 (25.2)
South	73,056 (52.5)	68,306 (47.8)
West	11,147 (8.0)	20,181 (14.1)
Charlson comorbidity score,[7] mean (SD)	2.70 (1.96)	1.95 (1.62)
Respiratory medication utilization (≥1 claim), n (%)		
Maintenance medication (≥1 claim in baseline period)	139,128 (100.0)	143,053 (100.0)
Rescue medication (≥1 claim in baseline period)	103,797 (74.6)	104,530 (73.1)
Maintenance medication (as of index date)	84,378 (60.7)	90,456 (63.2)

All-cause and disease-related HCRU

- Apparent decreases in all-cause and disease-related HCRU were observed at the beginning of the COVID-19 pandemic (March 2020) (**Figures 2** and **3**)
  - In April 2020, COPD- and asthma-related ambulatory, ER, and inpatient utilization was lowest
- From January 2018 to May 2022, the proportion of patients with COPD- or asthma-related utilization ranged as follows:

COPD-related

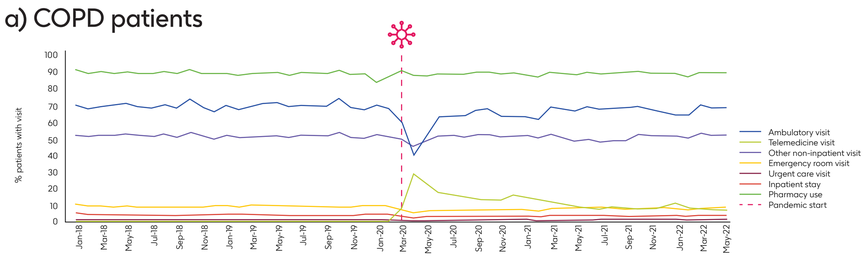
- Ambulatory visits: **14.9%** to **33.0%**
- ER visits: **2.6%** to **5.7%**
- Inpatient visits: **2.3%** to **4.9%**

Asthma-related

- Ambulatory visits: severe: **14.2%** to **31.6%**, non-severe: **7.0%** to **19.8%**
- ER visits: severe: **1.5%** to **4.2%**, non-severe: **0.8%** to **2.0%**
- Inpatient visits: severe: **0.8%** to **2.4%**, non-severe: **0.5%** to **1.2%**

Figure 2: **Monthly all-cause HCRU among COPD and asthma patients between January 2018 and May 2022**

a) COPD patients



b) Asthma patients

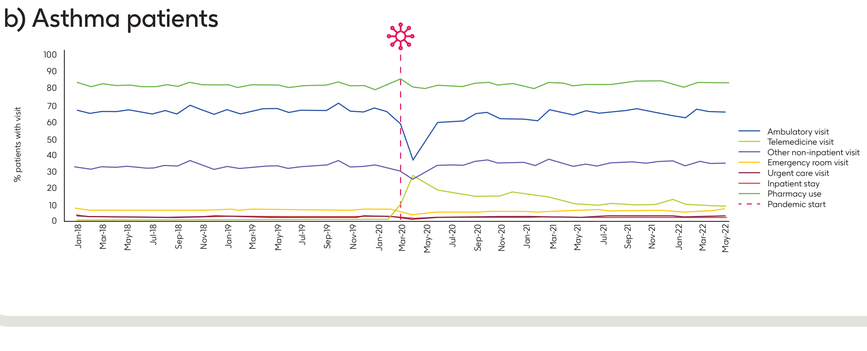
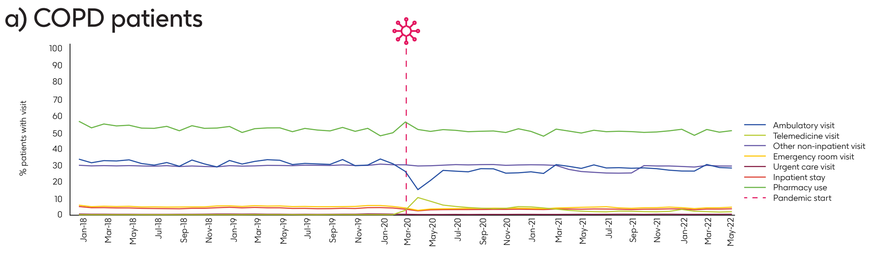
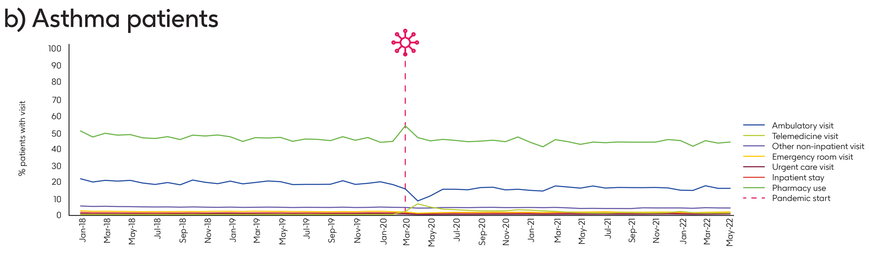


Figure 3: **Monthly disease-related HCRU among COPD and asthma patients between January 2018 and May 2022**

a) COPD patients



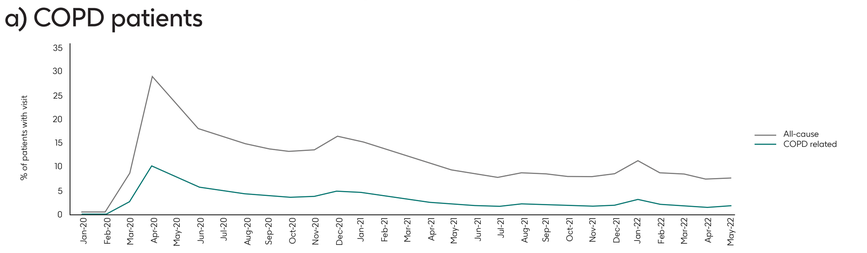
b) Asthma patients



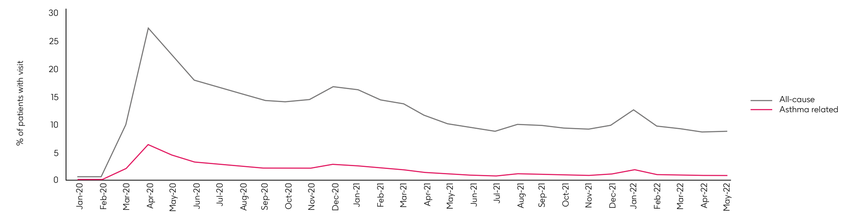
- Prior to March 2020, <1% of patients had all-cause telemedicine utilization (**Figure 4**)
- All-cause and disease-related telemedicine care peaked at the beginning of the pandemic (April 2020) and generally decreased, but remained elevated compared to pre-pandemic proportions through May 2022 (**Figure 4**)

Figure 4: **Monthly all-cause and disease-related telemedicine utilization among COPD and asthma patients between January 2020 and May 2022**

a) COPD patients



b) Asthma patients



All-cause and disease-related healthcare costs

- Similar to HCRU, all-cause and disease-related total monthly healthcare costs decreased in April 2020 and appeared to gradually increase thereafter until May 2022, to return to pre-COVID trends
  - Mean COPD-related healthcare costs were generally consistent across COPD treatment classes (ICS/LABA/LAMA)
  - Mean asthma-related healthcare costs were highest among patients with severe asthma compared to all or non-severe asthma patients

	Mean total COPD-related monthly costs	Mean total asthma-related monthly costs
April 2020	$890.47	$408.42
From May 2020 to May 2022	Ranged between $1035.26 and $1273.22	Ranged between $459.37 and $622.49

Limitations

- The lack of a general control cohort limits the generalizability of the study findings outside of the adult COPD and asthma population
- Within HCRU, exacerbation algorithms used in this study relied on medical encounters and/or pharmacy fills; stockpiling of rescue medication during the pandemic could have reduced the sensitivity of the algorithm to identify moderate COPD exacerbations and steroid-defined asthma exacerbations. Although telemedicine visits were incorporated into the algorithm, exacerbations among patients who stockpiled rescue medications may have been missed

Abbreviations

COPD, chronic obstructive pulmonary disease; COVID-19, coronavirus disease 2019; CPI, Consumer Price Index; ER, emergency room; HCRU, health care resource utilization; ICS, inhaled corticosteroid; LABA,long-acting beta-agonist; LAMA, long-acting muscarinic antagonist; SD, standard deviation.

References

1. Skevaki C, et al. Nat Rev Immunol 2021;21:202–203.
2. Birkmeyer JD et al. Health Aff (Millwood) 2020;39:2010–2017.
3. Jeffery MM et al. JAMA Intern Med 2020;180:1328–1333.
4. Sykes DL et al. ERJ Open Res 2021;7:00822-2020.
5. Lawless M et al. Medicina 2022;58:66.
6. Bukstein DA et al. Allergy Asthma Proc 2022;43:194–201.
7. Quan H et al. Am J Epidemiology 2011; 173:676–682.

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Disclosures

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The authors declare the following real or perceived conflicts of interest in relation to this presentation: GR, KJR, SG, ASI, HJB, CC, SGN, and RP are employees of GSK and hold stocks/shares in GSK. ASI is also a part-time, unpaid part-time professor at McMaster University. DL was an employee of, and/or held stocks/shares in, GSK at the time of this study. LYL is a university worker hired by GSK. AS and TB hold stocks/shares in United Health Group, Inc. and are employees of Optum, which received funding from GSK to conduct this study.

Digital poster

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