Healthcare Costs of COVID-19 versus Flu and Pneumonia – A US Payer Perspective

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Introduction

The Coronavirus Disease-2019 (COVID-19) from the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has shown key resemblances and differences with influenza[1], specifically:

- Both cause similar symptoms, such as fever, cough, body aches, and can result in pneumonia, and both can be asymptomatic, mild, moderate, severe/critical (SC) or fatal.
- However, COVID-19 may cause more serious illnesses in some people, and be generally more contagious, than influenza viruses.[2]

The cost of influenza has been previously estimated as follows: During the 2001/2002 - 2008/2009 seasons, in the USA, projected annual numbers of influenza-related healthcare expenditures extended from 11.3 to 25.6 million, and healthcare costs, from $2.0 to $5.8 billion.[3]

Objective

Estimate healthcare costs using a comprehensive analysis of all COVID-19-related claims during the duration of COVID-19 and compare them to payments for influenza or pneumonia (IP).

Methods

Study Design: Retrospective cohort study of patients in IBM® MarketScan® Commercial Claims and Encounters and Medicare Supplemental databases with COVID-19 from October 1st, 2020, to February 1st, 2021, compared with a matched cohort of patients with IP, IP from October 1st, 2018, to February 1st, 2019.

Variables: demographics at index and comorbidities, Elixhauser Comorbidity Index (ECI), specific health conditions not included in ECI (pregnancy, functional impairment (visual/hearing)), and all COVID-19 signs and symptoms (CSS). These were used to categorize patients as mild, moderate or severe, based on the Janssen Phase 3 Ensemble Clinical Trial definition of severity.[4]

Outcomes: All-cause and disease-specific payments, in Medicare Supplemental and Commercial database, for COVID-19 vs IP.

Statistics: Descriptive statistics – Propensity-score matched cohorts on age, gender, and comorbidities. Inflation-adjusted payments to 2021 consumer-price index estimated using generalized linear models (GLM) with gamma distribution and log link.

Results

- Before matching: 3,166 IP and 19,914 COVID-19 patients were identified in the Medicare Supplemental database, and 333,209 IP and 363,448 COVID-19 patients in the Commercial database.
- After matching, 397,532 Commercial and 6,332 Medicare Supplemental patients were identified. Their demographic information is show in Table 1.

Table 1. Baseline demographic characteristics/comorbidities of 1:1 matched cohorts (SD: Standard deviation)

Patient Demographic Characteristic/ Comorbidity	Commercial Population		Medicare Supplemental Population	
	IP	COVID-19	IP	COVID-19
Number	198,766	198,766	3,166	3,166
Mean Age (SD)	34.45 (17.14)	35.03 (16.36)	75.25 (7.61)	75.31 (7.63)
Gender: Female (%)	114,538 (57.6)	114,538 (57.6)	1,852 (58.5)	1,852 (58.5)
Severity (for COVID-19), n (%)				
Mild		92,059 (46.3)		732 (23.1)
Moderate		95,426 (48.0)		1,441 (45.5)
SC		11,281 (5.7)		993 (31.4)
Elixhauser Comorbidity Score, n (%)				
0	129,049 (64.9)	129,049 (64.9)	596 (18.8)	596 (18.8)
1-2	56,901 (28.6)	56,901 (28.6)	1,198 (37.8)	1,198 (37.8)
3-4	10,637 (5.4)	10,637 (5.4)	829 (26.2)	829 (26.2)
More than 4	2,179 (1.1)	2,179 (1.1)	543 (17.2)	543 (17.2)
Mean ECI (SD)	0.61 (1.07)	0.63 (1.10)	2.58 (2.26)	2.65 (2.37)

- Before matching imbalance included:
  - **In the Commercial cohort: IP patients were younger, with fewer comorbidities, compared to the COVID-19 cohort.** Average age (standard deviation (SD)) for IP patients: 23.8 (SD 18.7) vs average age (SD) for COVID-19: 39.9 (SD 15.7), Elixhauser Index for IP patients: 0.42 (0.90) vs Elixhauser Index for COVID-19: 0.87 (1.34), hypertension, diabetes, hypothyroidism, obesity and depression were nearly twice as prevalent in the COVID-19 cohort vs the IP patients.
  - **In the Medicare Supplemental cohort: Age was similar across cohorts (mean age 75 in both groups), but COVID-19 patients had more comorbidities and higher Elixhauser index.** Elixhauser index for IP patients: 2.58 (2.26) vs Elixhauser Index for COVID-19: 3.18 (2.51), all comorbidities were significantly more prevalent in the COVID-19 cohort compared to the IP cohort, except for lymphoma and rheumatoid arthritis.
- Two matched cohorts were created, matching on age, gender and Elixhauser comorbidity index. The pre- and post-matching balance is shown in Figures 1A and 1B. Matched demographics are shown in Table 1.

Cost analyses are shown in Table 2, from the matched cohorts. Costs for patients with IP were significantly lower than those of patients with severe COVID-19 disease, but higher that those of patients with mild COVID-19 disease.

Figure 1: Pre- vs post-matching balance of age, gender and Elixhauser comorbidity index category, in Commercial and Medicare Supplemental cohorts. (A: Commercial, B: Medicare Supplemental)

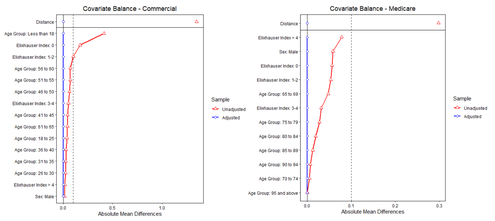

Table 2. Adjusted and incremental payments of patients with IP vs COVID-19 stratified by severity of disease (CI: Confidence interval)

	Commercial	Medicare
All Cause payments, Mean (95%CI)		
IP	$2,985 (95%CI:$2,856-$3,114)	$11,726 (95%CI:$10,510 -$12,943)
Mild COVID-19	$1,259 (95%CI:$1,189-$1,327)	$2,803 (95%CI:$2,236.8 -$3,369)
Moderate COVID-19	$4,068 (95%CI:$ 3,859-$4,276)	$7,175 (95%CI:$6,145 -$8,205)
SC COVID-19	$53,311 (95%CI:$ 46,903-$59,717)	$37,105 (95%CI:$30,992 -$43,218)
Disease Specific payments, Mean (95%CI)		
IP	$980 (95%CI:$0.948-$1,013)	$3,466 (95%CI:$3,092 -3,840$)
Mild COVID-19	$467 (95%CI:$0,446-$0,490)	$657 (95%CI:$0,510 -$0,803)
Moderate COVID-19	$1,753 (95%CI:$1,674-$1,832)	$2,280 (95%CI:$1,923 -$2,637)
SC COVID-19	$25,833 (95%CI:$22,555-$29,112)	$13,631 (95%CI:$11,136 -$16,125)
All Cause Incremental payments, Mean (95%CI)		
from IP to SC COVID-19	$50,325 (95%CI:$ 43,932 -$56,718)	$25,378 (95%CI:$ 19,248 -$31,508)
Disease Specific Incremental payments, Mean (95%CI)		
From IP to SC COVID-19	$24,852(95%CI:$ 21,573 -$28,132)	$10,164 (95%CI:$ 7,652 -$12,676)

Key Findings

- **Before matching: patients with symptomatic COVID-19 vs influenza/ pneumonia presented different demographic and clinical characteristics.**
- **After matching, the COVID-19 cohort included 46% mild, 48% moderate and 6% severe/critical cases in the Commercial population, and 23% mild, 45% moderate and 32% severe/critical cases in the Medicare Supplemental population. Severity was not assessed for influenza/ pneumonia.**
- **Influenza/pneumonia costs were higher than mild COVID-19. Compared to moderate COVID-19, influenza/ pneumonia costs were lower in the Commercial population but higher in the Medicare Supplemental cohort. Costs of severe/critical COVID-19 were greater than those of influenza/pneumonia in both databases.**

Conclusions

- **The payments for care for severe/critical COVID-19 significantly exceeded those for the general influenza/pneumonia population, both for Commercial and Medicare Supplemental payers, including all-cause or disease-specific healthcare claims.**

References:

1. Paules, C.I., et al. JAMA, 2020. **323**(8): p. 707-708.
2. Centers for Disease Control and Prevention. *Similarities and Differences between Flu and COVID-19.* 04/08/2022]; Available from: https://www.cdc.gov/flu/symptoms/flu-vs-covid19.htm.
3. Yan, S., D. Weycker et al. Hum Vaccin Immunother, 2017. **13**(9): p. 2041-2047.
4. https://www.jnj.com/coronavirus/ensemble-1-study-protocol - Last Accessed 04/04/2022.

Abbreviations:

COVID-19: Coronavirus disease 2019
CI: Confidence interval
CSS: COVID-19 signs and symptoms
ECI: Elixhauser Comorbidity Index
GLM: Generalized linear model
IP: Influenza or pneumonia
SC: Severe/Critical
SD: Standard deviation

ISPOR – May 15-18, 2022