Original Investigation | Infectious Diseases

Use of the Postacute Sequelae of COVID-19 Diagnosis Code in Routine Clinical Practice in the US

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Abstract

IMPORTANCE A new *International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM)* diagnosis code (U09.9 Post COVID-19 condition, unspecified) was introduced by the Centers for Disease Control and Prevention on October 1, 2021.

OBJECTIVE To examine the use of the U09.9 code and describe concurrently diagnosed conditions to understand physician use of this code in clinical practice.

DESIGN, SETTING, AND PARTICIPANTS This cohort study of US patients with an *ICD-10-CM* code for post–COVID-19 condition used deidentified patient-level claims data aggregated by HealthVerity. Children and adolescents (aged 0-17 years) and adults (aged 18-64 and ≥65 years) with a post–COVID-19 condition code were identified between October 1, 2021, and January 31, 2022. To identify a prior COVID-19 diagnosis, 3 months of continuous enrollment (CE) before the post–COVID-19 diagnosis date was required.

MAIN OUTCOMES AND MEASURES Presence of the *ICD-10-CM* U09.9 code.

RESULTS There were 56 143 patients (7723 female patients [61.2%]; mean [SD] age, 47.6 [19.2] years) with a post–COVID-19 diagnosis code, with cases increasing in mid-December 2021 following the trajectory of the Omicron case wave by 3 to 4 weeks. The analysis cohort included 12 622 patients after the 3-month preindex CE criteria was applied. Among this cohort, the median (IQR) age was 49 (35-61) years; however, 1080 (8.6%) were pediatric patients. The U09.9 code was used most often in the outpatient setting, although 305 older adults (14.0%) were inpatients. Only 698 patients (5.5%) had at least 1 of the 5 codes listed as possible concurrent conditions in the coding guidance. Only 8879 patients (70.4%) had a documented acute COVID-19 diagnosis code (569 [52.7%] among children), and the median (IQR) time between acute COVID-19 and post–COVID-19 diagnosis codes was 56 (21-200) days. The most common concurrently coded conditions varied by age; children experienced COVID-19–like symptoms (eg, 207 [19.2%] had cough and 115 [10.6%] had breathing abnormalities), while 459 older adults aged 65 years or older (21.1%) experienced respiratory failure and 189 (8.7%) experienced viral pneumonia.

CONCLUSIONS AND RELEVANCE This retrospective cohort study found patients with a post–COVID-19 *ICD-10-CM* diagnosis code following the acute phase of COVID-19 disease among patients of all ages in clinical practice in the US. The use of the U09.9 code encompassed a wide range of conditions. It will be important to monitor how the use of this code changes as the pandemic continues to evolve.

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Key Points

Question How is the *International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM)* code for postacute sequelae of COVID-19 being used in clinical practice?

Findings In this cohort study, 56 143 patients had an *ICD-10-CM* code for post–COVID-19 conditions; among patients with 3 months of preindex continuous enrollment, 1080 (8.6%) were children. Only 698 patients (5.5%) had at least 1 of the 5 codes listed as possible concurrent conditions in the coding guidance.

Meaning These findings suggest the diagnosis code is being used to identify patients of all ages with continuing illness following the acute phase of disease; however, the clinical presentation of postacute COVID-19 spans a range of conditions.

+ **Supplemental content**

Author affiliations and article information are listed at the end of this article.

Introduction

Postacute sequelae of COVID-19 are increasingly documented in patients recovering from the infection weeks to months after the acute episode.[1,2] These persistent or delayed-onset sequelae can occur across the spectrum of acute infection severity, from asymptomatic patients to those requiring mechanical ventilation.[3] Manifestation of post–COVID-19 can range from nonspecific symptoms such as fatigue, muscle weakness, and headache[3] to specific conditions such as myocarditis,[2] decreased glomerular filtration rate,[4] and impaired lung function.[1]

Given the uncertainties in defining postacute sequelae of COVID-19, diagnosis in clinical practice remains challenging. To improve the documentation of post–COVID-19, a new *International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM)* diagnosis code (U09.9 Post COVID-19 condition, unspecified) was introduced on October 1, 2021.[5] We aimed to examine the use of the new code and describe concurrently diagnosed conditions to understand how physicians are using this code in clinical practice.

Methods

This retrospective cohort study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline. This study was considered exempt from review and the need for informed consent by Sterling institutional review board due to the use of deidentified data. We analyzed deidentified patient-level open and closed claims data aggregated by HealthVerity and refreshed in nearly real time. The HealthVerity database contains all major payer types (commercial, Medicare, and Medicaid) and links the patient journey across inpatient admissions, outpatient visits, and pharmacy services. Children and adolescents (aged 0-17 years) and adult patients (aged 18-64 and ≥65 years) with a post–COVID-19 condition code (*ICD-10-CM* code U09.9) were identified in both open and closed claims between October 1, 2021, and January 31, 2022. The index date was defined as the first post–COVID-19 diagnosis date. Weekly numbers were plotted over time to visually compare the use of the post–COVID-19 condition code to the trajectory of the Omicron case wave.

To assess patient characteristics and to identify prior COVID-19 diagnosis, we required 3 months of continuous enrollment before the index date, which limited the analysis to closed claims. The 3-month period was chosen to ensure patients were actively enrolled and all claims were visible to assess prior disease, but also maximized the available sample size.

Figure 1. Weekly Number of Post–COVID-19 Diagnosis Codes and COVID-19 Diagnosis Codes, October 1, 2021, to January 28, 2022 (Open and Closed Claims)
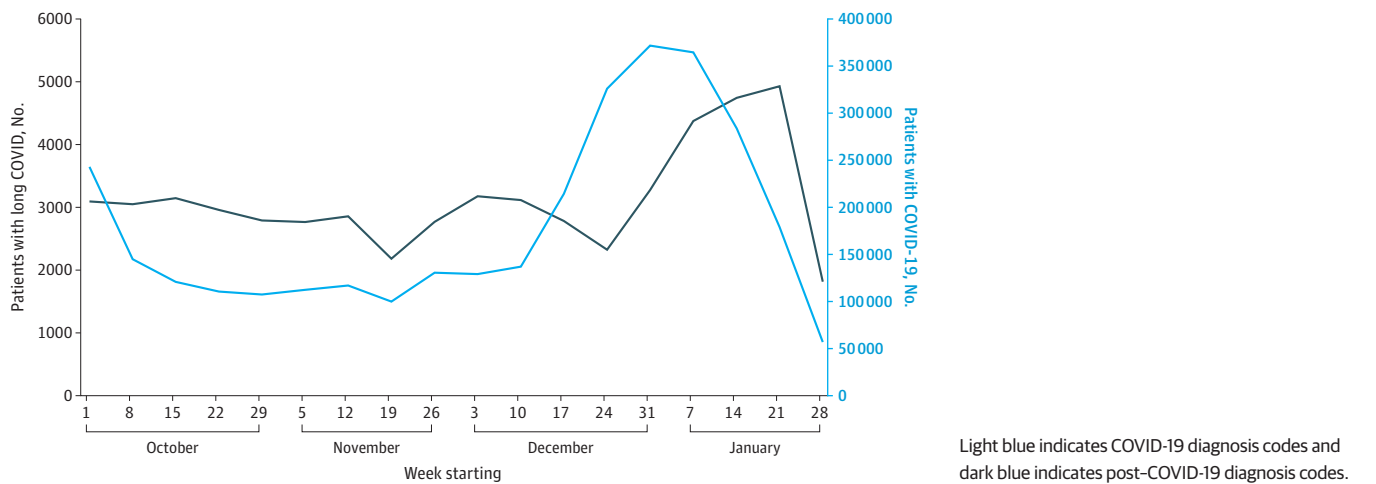

Light blue indicates COVID-19 diagnosis codes and dark blue indicates post–COVID-19 diagnosis codes.

Table. Baseline Characteristics of Patients With a Post–COVID-19 Diagnosis Code, October 1, 2021,
to January 31, 2022

Characteristics	Patients, No. (%)			
	Overall (N = 12 622)	Age 0-17 y (n = 1080)	Age 18-64 y (n = 9363)	Age ≥65 y (n = 2179)
Age, y				
Median (IQR)	49.0 (35.0-61.0)	13.0 (8.5-15.0)	47.0 (36.0-56.0)	72.0 (67.0-79.0)
Mean (SD)	47.6 (19.2)	11.6 (4.4)	45.4 (12.3)	74.7 (9.4)
Sex				
Female	7723 (61.2)	557 (51.6)	5857 (62.6)	1309 (60.1)
Male	4899 (38.8)	523 (48.4)	3506 (37.4)	870 (39.9)
Location (US Census region)				
Northeast	1192 (9.4)	51 (4.7)	860 (9.2)	281 (12.9)
Midwest	3000 (23.8)	226 (20.9)	2189 (23.4)	585 (26.9)
South	5510 (43.7)	644 (59.6)	4003 (42.8)	863 (39.6)
West	2900 (23)	159 (14.7)	2297 (24.5)	444 (20.4)
Other	4 (<1)	0	3 (<1)	1 (0.1)
Missing	16 (0.1)	0	11 (0.1)	5 (0.2)
Insurance type				
Commercial	6697 (53.1)	305 (28.2)	5766 (61.6)	626 (28.7)
Medicaid	4719 (37.4)	775 (71.8)	3353 (35.8)	591 (27.1)
Medicare Advantage	1095 (8.7)	0	191 (2)	904 (41.5)
Unknown	49 (0.4)	0	17 (0.2)	32 (1.5)
Missing	62 (0.5)	0)	36 (0.4)	26 (1.2)
Prior COVID-19 vaccine (≥1 dose)	3437 (27.2)	196 (18.2)	2802 (29.9)	439 (20.2)
Concurrent conditions per coding guidance and *ICD-10-CM* code				
≥1 Concurrent code	698 (5.5)	55 (5.1)	419 (4.5)	224 (10.3)
Chronic respiratory failure (J96.1)	232 (1.8)	0	136 (1.5)	96 (4.4)
Loss of smell or taste (R43.8)	70 (0.6)	10 (0.9)	48 (0.5)	12 (0.6)
Multisystem inflammatory syndrome (M35.81)	55 (0.4)	44 (4.1)	8 (0.1)	3 (0.1)
Pulmonary embolism (I26)	220 (1.7)	1 (0.1)	151 (1.6)	68 (3.1)
Pulmonary fibrosis (J84.10)	151 (1.2)	0	95 (1.0)	56 (2.6)
Post–COVID-19 diagnosis location				
Inpatient	858 (6.8)	48 (4.4)	505 (5.4)	305 (14)
Emergency department	558 (4.4)	36 (3.3)	485 (5.2)	37 (1.7)
Outpatient	6419 (50.9)	719 (66.6)	4870 (52)	830 (38.1)
Nursing, hospice, or group home	94 (0.7)	0	19 (0.2)	75 (3.4)
Other	2064 (16.4)	184 (17)	1640 (17.5)	240 (11)
Missing	2629 (20.8)	93 (8.6)	1844 (19.7)	692 (31.8)
Prior COVID-19 diagnosis	8879 (70.4)	569 (52.7)	6612 (70.6)	1698 (77.9)
COVID-19 diagnosis location[a]				
Inpatient	1675 (18.9)	25 (4.4)	1027 (15.5)	623 (36.7)
Emergency department	1571 (17.7)	67 (11.8)	1217 (18.4)	287 (16.9)
Outpatient	3608 (40.6)	328 (57.6)	2897 (43.8)	383 (22.6)
Nursing, hospice, or group home	40 (0.5)	0	9 (0.1)	31 (1.8)
Other	1328 (15)	118 (20.7)	1036 (15.7)	174 (10.2)
Missing	657 (7.4)	31 (5.4)	426 (6.4)	200 (11.8)
Time from COVID diagnosis to postacute COVID, d				
Mean (SD) [range]	130.2 (153.2) [1-743]	86.8 (114.8) [1-633]	133.6 (154.6) [1-669]	131.4 (156.7) [1-743]
Median (IQR)	56 (21-200)	40 (14-101)	59 (22-214)	51 (21-228)

Abbreviation: *ICD-10-CM*, International Classification of Diseases, Tenth Revision, Clinical Modification.

[a] Among those with a prior COVID-19 diagnosis.

Demographics were measured on the index date. Prior COVID-19 diagnosis (*ICD-10-CM* code U07.1) was identified using all available lookback time before the index date (eg, 3-month continuous enrollment and all available history extending back to April 2020). The all-available lookback approach attempted to mitigate misclassification of prior COVID-19 status.

Statistical Analysis

All study variables were summarized with descriptive statistics (ie, counts and percentages for categorical variables, and means, SDs, medians, and IQRs for continuous variables). The frequency of concurrent diagnosis codes was evaluated on the index date and was reported descriptively by age category. We also assessed the most common diagnosis codes within the 30 days before the index post–COVID-19 condition code. Descriptive statistics were performed by Genesis Research, Inc using SAS statistical software version 9.4 (SAS Institute, Inc). As this was a descriptive study using a retrospective database, sample size and power were not calculated. There were no sensitivity analyses conducted for this study.

Results

There were 56 143 patients with a post–COVID-19 condition diagnosis code, of whom 12 622 had 3 months of continuous enrollment (7723 female patients [61.2%]; median [IQR] age 49.0 [35.0-61.0]

Figure 2. Observed Proportions of Concurrent Diagnosis Codes on the Day of Post–COVID-19 Diagnosis Code by Age
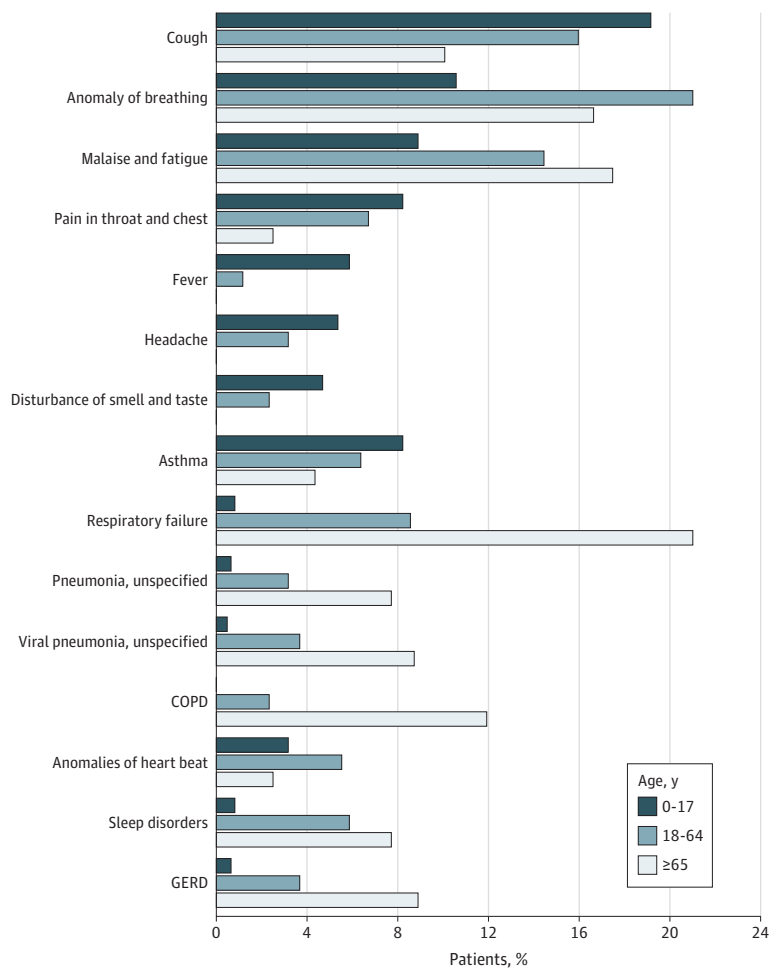
COPD indicates chronic obstructive pulmonary disease; GERD, gastroesophageal reflux disease.

years). Among all open and closed claims, the post–COVID-19 code was used immediately after it was released and plateaued until mid-December 2021 when numbers increased. This followed the trajectory of the Omicron case wave by 3 to 4 weeks (**Figure 1**). After the 3-month continuous enrollment criteria were applied, there were 12 622 patients remaining in the analytic cohort (eFigure in the Supplement). The decrease in sample size was due to the use of closed claims (ie, insurance claims sourced from insurance providers that have undergone an adjudication or payment process) for the variables requiring a lookback period. The median (IQR) age at diagnosis was 49 (35-61) years; however, 1080 cases (8.6%) occurred in pediatric patients and 2179 cases (17.3%) occurred in adults aged 65 or more years. The majority (9363 cases [74.2%]) of post–COVID-19 cases occurred in younger adults. Post–COVID-19 was more common among female patients (7723 cases [61.2%]), and was often diagnosed in the outpatient setting, although 305 cases (14.0%) occurring in older adults were coded as inpatient. Only 698 patients (5.5%) had at least 1 of the 5 codes listed as possible concurrent conditions in the coding guidance (**Table**).

Additionally, 8879 patients (70.4%) had a documented COVID-19 diagnosis before the post–COVID-19 diagnosis, although fewer children had a prior COVID-19 code (569 cases [52.7%]). The median (IQR) time between the COVID-19 and post–COVID-19 diagnosis was 56 (21-200) days, ranging from 40 days for children to 59 days for younger adults (Table). The most common concurrent conditions varied by age; children aged 0 to 17 years experienced COVID-19–like symptoms (eg, cough, 207 cases [19.2%]; and breathing abnormalities, 115 cases [10.6%]), whereas more serious conditions were more common among adults 65 years or older (eg, respiratory failure, 459 cases [21.1%]; and viral pneumonia,189 cases [8.7%]) (**Figure 2** and eTable in the Supplement).

Signs and symptoms (eg, cough and breathing abnormalities) were slightly less common on the day of the post–COVID-19 diagnosis code compared with the 30 days before the post–COVID-19 diagnosis code. Comparatively, more serious conditions (eg, respiratory failure and viral pneumonia) were slightly more common in the 30 days before the post–COVID-19 code compared with the day of the post–COVID-19 code (**Figure 3**).

Figure 3. Observed Proportion of Diagnosis Codes on the Day of the Post–COVID-19 Diagnosis Code vs in the 30 Days Before the Post–COVID-19 Diagnosis Code
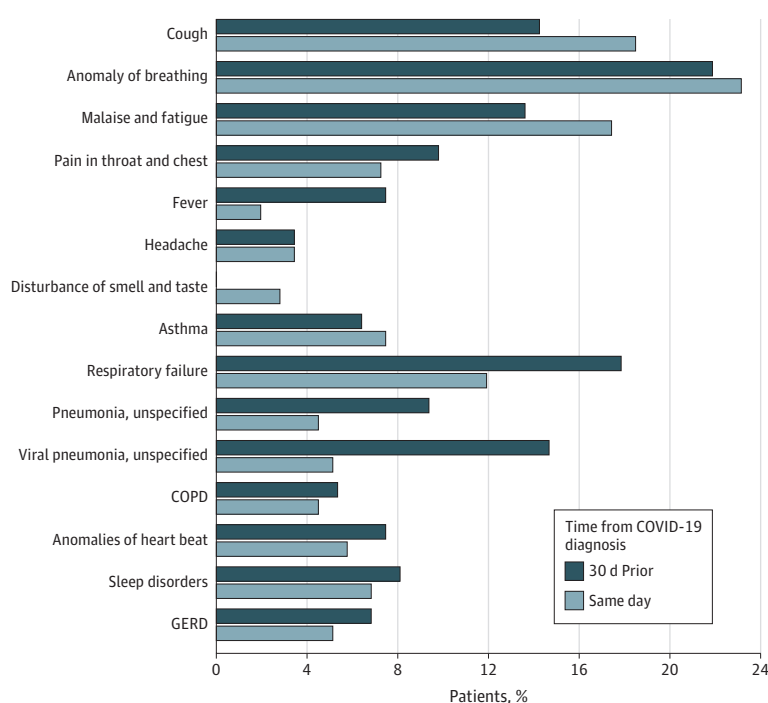
COPD indicates chronic obstructive pulmonary disease; GERD, gastroesophageal reflux disease.

Discussion

After the release of a new *ICD-10-CM* code for post–COVID-19 condition in October 2021, we observed this code among 56 143 patients through January 31, 2022, in this cohort study. When new codes are added to the *ICD-10-CM* coding dictionary, it is not always clear how quickly they will be used. Similar to when the code for acute COVID-19 (U07.1) was introduced, there was immediate use in routine clinical practice.[6] We also observed increasing use later in January 2022, approximately 1 month after the peak in COVID-19 diagnoses, suggesting a temporal association with acute case epidemiology. The guidance for the post–COVID-19 condition code recommends concurrently coding 1 of the following conditions: chronic respiratory failure, loss of smell or taste, multisystem inflammatory syndrome, pulmonary embolism, or pulmonary fibrosis.[7] However, clinicians' use of the post–COVID-19 code is not limited to these specific symptoms or diseases. Indeed, we observed very few patients (5.5%) with these conditions. It appears that physicians are using this code to represent a multitude of symptoms, conditions, and body systems. The seemingly broad use of this new diagnosis code is not unexpected. COVID-19 has previously been linked to developing chronic conditions (eg, cardiovascular and kidney disease), which could be more severe in older age groups.[8] This may explain why we observed 14.0% of adults aged 65 years or older coded with post–COVID-19 condition in an inpatient setting. Although our study was not designed to determine whether these concurrent conditions were incident or exacerbations of preexisting chronic conditions, it is likely that older adults with post–COVID-19 experience more varied and complicated sequelae. Further research using other databases (eg, electronic health records) is needed to examine potential overlap between the post–COVID-19 code and clinical signs and symptoms. Although the majority (74.2%) of post–COVID-19 cases occurred in younger adults, 8.6% occurred in children. The most common concurrent diagnoses in children were signs and symptoms including cough, breathing abnormalities, malaise, and throat and chest pain. These are symptoms similar to those reported in other prospective studies.[9-11] It is important to note that most post–COVID-19 codes were identified in the outpatient setting vs the inpatient setting. However, further analyses could stratify by care setting to further describe differences between these patients. Among those with a prior documented COVID-19 diagnosis (8879 cases [70.4%]), the time to the post–COVID-19 diagnosis code was a median (IQR) of 56 (21-200) days. This contributes to the body of literature seeking to understand when post–COVID-19 starts. The median time of 56 days is aligned with post–COVID-19 starting at either 3 or 4 weeks,[4] as viral shedding declines over the course of 2 weeks, although prolonged shedding has been documented for severe cases.[12]

Limitations

This study has limitations. HealthVerity includes both open and closed claims, so it is possible that claims for post–COVID-19 were missing, particularly in the later period. Therefore, we did not attempt to estimate the proportion of the population with post–COVID-19. Second, this study captures only medically attended COVID-19 diagnoses and, thus, the 70% with a prior diagnosis is likely an underestimate. It is possible that individuals tested positive with a home test, with a polymerase chain reaction test that was not submitted, or tested positive before entering the database. Additionally, we did not have laboratory confirmation of COVID-19 diagnosis. Third, this data source includes patients with commercial insurance, Medicaid, and Medicare. It may not be generalizable to uninsured patients or patients with other types of insurance. Fourth, vaccination status is underestimated in claims data due to the nature of vaccination distribution in the US. Therefore, we were unable to present reliable vaccination information by dose or by brand, or to ensure that the unvaccinated population was truly unvaccinated. Fifth, given the epidemiology of COVID-19, the lack of racial and ethnic data is also a substantial limitation of this analysis.

Conclusions

These findings present an early description of how physicians are using the post–COVID-19 condition *ICD-10-CM* code in routine care settings. This diagnosis code is being used to identify patients with illness following the acute phase of infection in patients of all ages. However, manifestations of post–COVID-19 include a wide range of conditions. Although this code could provide a quantifiable method to measure the burden of post–COVID-19 using clinical practice data, further use of this code for research is limited until a standard definition of post–COVID-19 is agreed upon by the medical and public health community. It will be important to monitor how the use of this code changes as the pandemic continues to evolve. Additional follow-up studies are warranted in other data sources as data becomes available.

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SUPPLEMENT.
eFigure. Attrition Diagram
eTable. Top 25 Concurrent Diagnosis Codes, Overall and By Age