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The German Influenza Gap 2021 - A Multifactorial View

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Abstract

The end of the 2019/2020 influenza season was already registered in early summer 2020, and in the following season. There was an nearly complete absence of influenza. So far, the sometimes strict Covid-19 containment measures with contact restrictions and the obligation to wear a mask have been mentioned as reasons. The further processing of this influenza gap showed multifactorial reasons also the lack of registration of influenza cases This study looks for further reaseons and from several perspectives in order to develop strategies for a representative recording of influenza cases derive.

For Evaluation the data of GrippeWeb, the RKI's Survstat® tool and the RKI's reporting data on the new coronavirus were used. In addition, an evaluation of billing data from the EBM from 2017 to 2022 for the GOP 32816 as well as an evaluation of data on sick leave and illness statistics from 2019 to 2021 and the consideration of inpatient and outpatient health costs based on the data requested in writing from the Federal Ministry of Health was performed. In contrast to influenza A/B, the other viral respiratory pathogens (adenovirus, parainfluenza virus and RS virus) do not show any significant reduction. From 2020, the number of reports of respiratory infections to the RKI increased from an average of 300,000 annual reports by 2019 to 1,985,985 reports in 2020, over 5,453,017 reports in 2021 and to 29,681,158 in 2022. On the other hand cases of incapacity to work due to respiratory infections fell from 31.0% in 2019 to 15.3% in 2021. Influenza-specific diagnoses (ICD: J10.1-3) were encrypted 33,727 times in 2021, in 2020 there were still 109,846. In the outpatient sector in particular, the treatment costs are falling from 2019 to 2021. The reduction in influenza A and B from 2020 as a result of the comprehensive Covid-19 control measures, including the obligation to wear masks, cannot be considered a major reason; rather, the aspect of underreporting of influenza cases plays a significant role. Therefore, the reporting quantity of the sentinal practices should be considered and the recording of incapacity diagnoses should be taken into account.

Keywords: Covid-19, Influenza, RKI, GrippeWeb

1. Introduction

Seasonal influenza causes 3 to 5 million cases of illness and an estimated 290,000–650,000 deaths annually worldwide [1]. A meta-analysis published in 2018 comes to the conclusion that around 10% of unvaccinated adults become infected with influenza every year [2]. In Germany, the RKI has been using the GrippeWeb portal since 2011 to conduct an intensive and detailed scientific examination of influenza outbreaks, which plays a pioneering role in Europe [3]. In the 2017/18 season, for example, the estimate of influenza-related doctor visits was around 9 million. Most illnesses were caused by influenza B viruses. Influenza-related sick leave was estimated at 5.3 million this season and influenza-related hospitalizations at approximately 45,000. The estimated value for influenza-related doctor visits is around 2 million higher than in the 2012/13 and 2014/15 seasons, as is the estimate for hospital admissions and the number of laboratory-confirmed hospitalized influenza cases [4].

The premature end of the influenza season in 2019/2020 and the almost complete absence of the influenza season 2020/2021 was registered both in Germany and in Europe [5,6,7]. In the decades leading up to 2020, most influenza cases in the Northern Hemisphere occur in late January and February and the influenza season is characterized by several recurring factors including the predominant influenza virus strains, background immunity and vaccine effects [5,6,7]. Expressed in numbers, 479 laboratory-confirmed influenza cases have been reported to the Robert Koch Institute (RKI) since week 40/2020. In the same period of 2019 of the 2019/20 flu season, 165 036 cases were reported. The ECDC also notes in Flu News for the 2020/2021 season that the positive rate of sentinel samples has fallen to 0.1% [8].

This phenomenon was considered in several studies from German-speaking countries. The stricter hygiene measures due to the corona pandemic, such as lockdown, distance rules and the obligation to wear masks, were discussed as the main reasons for the absence of the annual flu epidemic. In particular, the correct wearing of FFP-2 masks is said to have contributed to reducing infection with influenza viruses [5,9] and noroviruses [10].

Similar to influenza, a significant decrease in measles infections was registered in 2020 after the number of infections had previously increased [9]. Furthermore, there has been a decline in varicella and rubella but a decrease in sexually transmitted diseases and food-borne diseases has also been observed [[11,12]. Overall, a significant reduction in almost all recorded infectious diseases in 2020 [13]. This observed decrease in infectious diseases is mainly attributed to the control strategies introduced by Covid-19 [9].

Heinzinger et al also discuss overburdening, especially in the outpatient health care system, as a further reason for the reduction in the number of influenza cases, since a reduced number of reports can be reflected in the increased workload [8].

There are multifactorial reasons for the lack of registration of influenza cases, so this study aims to illuminate the striking reduction in influenza cases in 2020 and 2021 from several perspectives. With this knowledge gained, strategies for a representative recording of influenza cases can be derived.

2. Methodology

The data from GrippeWeb and the RKI's Survstat® tool were used and statistically evaluated to evaluate the flu cases [14,15]. In addition, a written request was sent to all 17 County associations of health insurance departments (KV) with the request for billing data to be transmitted for billing number:

1. [32006] Illnesses or suspected illnesses for which there is a legal obligation to report if microbiological tests are carried out, or cases of illness with reportable evidence of a pathogen
2. [32841] Influenza A and B (not if bird flu is suspected)

The data analysis on incapacity for work was based on the results of the Federal Ministstry of Health, which breaks down the cases and days of incapacity for work according to diagnoses for the years 2019 and 2020 [15,16]. For the evaluation year 2021, the data collection was based on the health reports 2021 of the German health insurances AOK, the Barmer and the Techniker Krankenkasse (TK) [17-19]. The data requested in writing from the National associations of health insurance department (KBV) for the years 2019 to 2021 was used to evaluate the sickness statistics for the years 2019 to 2021. The consideration of inpatient and outpatient health care costs in the same period was evaluated using the data requested in writing from the Federal Ministry of Health.

The collection and statistical evaluation of the data was carried out with SPSS Statistics 26 for Windows and was purely descriptive. A vote by the ethics committee is not necessary, since no data protection-relevant and personal data was evaluated.

3. Results

Of the 17 County associations of health insurance departments, 5 departments with a total of 37,542,000 insured persons (as of 2022) responded in writing by December 30, 2022. This corresponds to coverage of 45.2% of the total population and is to be regarded as representative.

The data initially show the expected billing frequency in the flu months around the 1st quarter of each year with a significant increase in the test frequency from the 2nd quarter of 2020 for the EBM fee items 32006 and 32841. At the same time, the positive reports are reduced to less than 100 cases, also from the 2nd th quarter of 2020 in GrippeWeb [14]. This data results in a positive rate for influenza A and B of up to a maximum of 23.38% in the first quarter of 2018 and an annual average of 4.26%. Furthermore, there is no correlation between the test frequency and the positive report (Fig. 1) the Pearson correlation coefficient is -0.14.

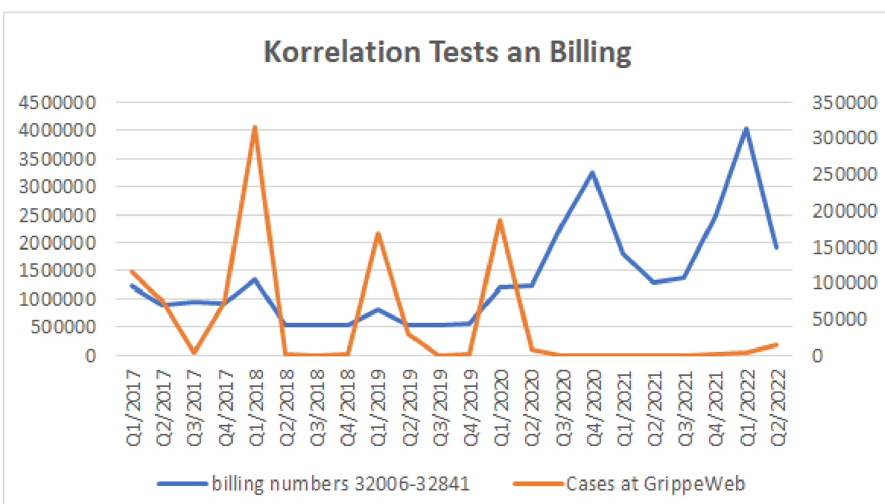

Figure 1: Representation of Billing and Flu Case Reports for 2017 to 2021 using the Survstat Tool

If one considers the other viral respiratory tract pathogens (adenovirus, parainfluenza and RS viruses) in addition to influenza A and B, there are no significant differences in the occurrence of adenovirus-related respiratory tract infections. Parainfluenza and RSV infections only show a significant reduction in 2022, but not in 2021, like influenza A/B (Fig. 2).

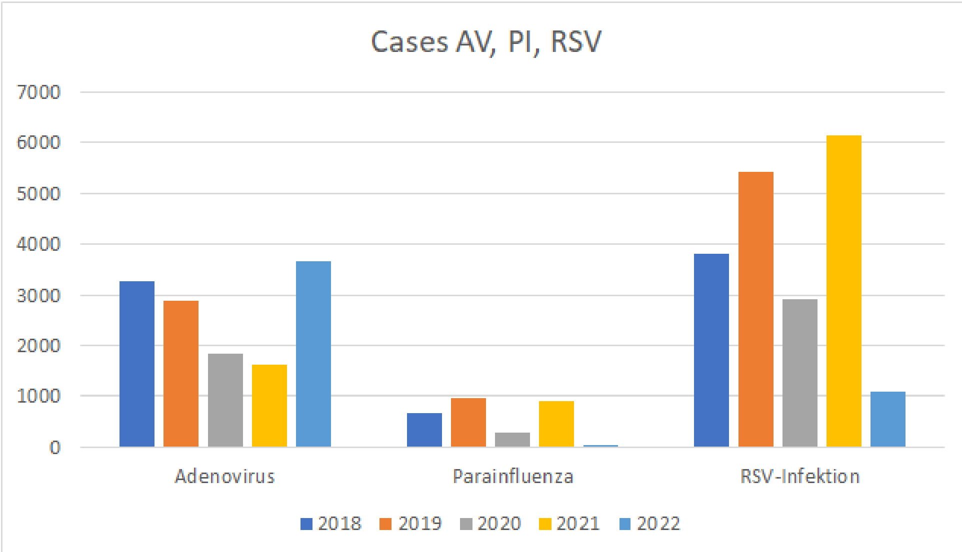

Figure 2: Representation of Viral Respiratory Infections for 2017 To 2021 using the Survstat Tool

A clear change in the spread of viral respiratory infections can be seen from 2020. Not only did influenza A/B, which had previously been the leader at over 90%, fell to 10% of the total in 2020 and tended towards zero from 2021, the number of respiratory infections was also reported The RKI exploded from an average of 300,000 annual reports by 2019 to 1,985,985 reports in 2020, over 5,453,017 reports in 2021 and by week 49/2022 to 29,681,158 per calendar year due to the spread of the novel SARS-CoV-2.

The Barmer health insurance company, on the other hand, reports 58.8% fewer diseases of the respiratory system for 2021 with a simultaneous increase of only 19.0% in cases of illness with "code numbers for special purposes", which the code numbers of the SARS-CoV-2 diseases U07 and Includes U99. These were not yet recorded by the Federal Ministry of Health in 2021 [19-21]. This clear net decline in cases of sick leave, especially in 2021, is also reflected in the evaluation of the health reports of the health insurance AOK with 14,087,213 insured persons in 2021 and the health insurance Techniker Krankenkasse with 8,260,286 insured persons in 2021 for the diagnoses of respiratory diseases among the 40 most common ICD-Codes: J00, J01, J02, J03, J06, J09, J20, J32, J40, J98, B34, B99, U07, U99 (Fig. 3, Appendix).

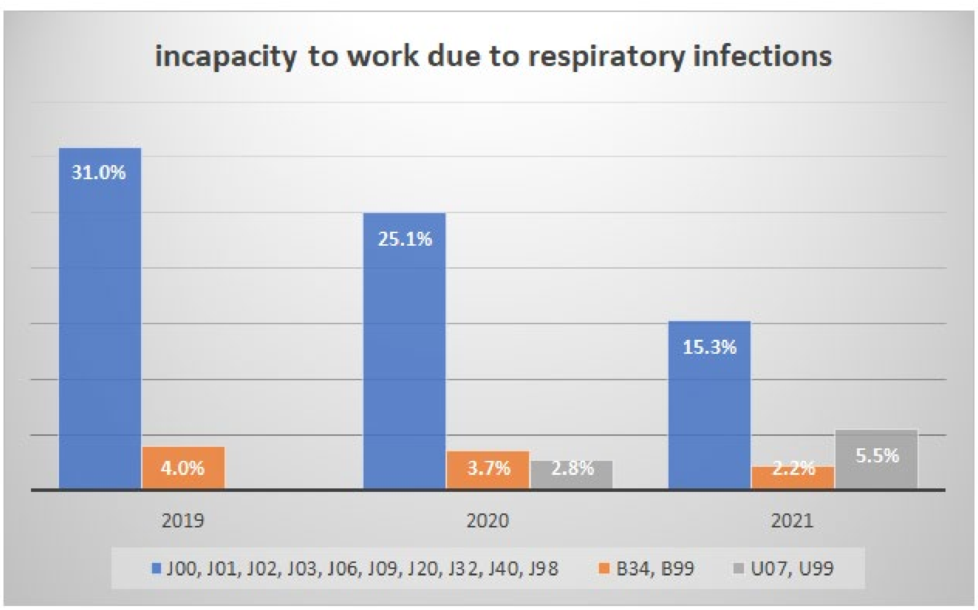

Figure 3: Frequency of Respiratory Diseases 2019 - 2021

The following diagnostic keys:
J10.0 influenza with pneumonia, seasonal influenza viruses detected
J10.1 Influenza with other respiratory manifestations, seasonal influenza viruses detected
J10.8 Influenza with other manifestations, seasonal influenza viruses detected
denote influenza infections detected by quantified laboratory tests.

Figure 4 shows the frequency of diagnosis encryption and shows that influenza-specific diagnoses were encrypted 33,727 times in 2021; in 2020, with 109,846 encryptions, it was almost 3 times more. The reduction in the ICD-10 code J09, which describes flu caused by zoonotic or pandemic influenza viruses detected, is even lower, with a halving compared to 2017 and a reduction to ¼ compared to the “flu year” 2018

Apart from the reduction in the ICD coding for influenza already described, the ICD code groups of other diagnoses of acute respiratory infections J00, J32, J98, B34 and B99 in particular show no significant changes in the pandemic years 2020 and 2021 (Fig. 4).

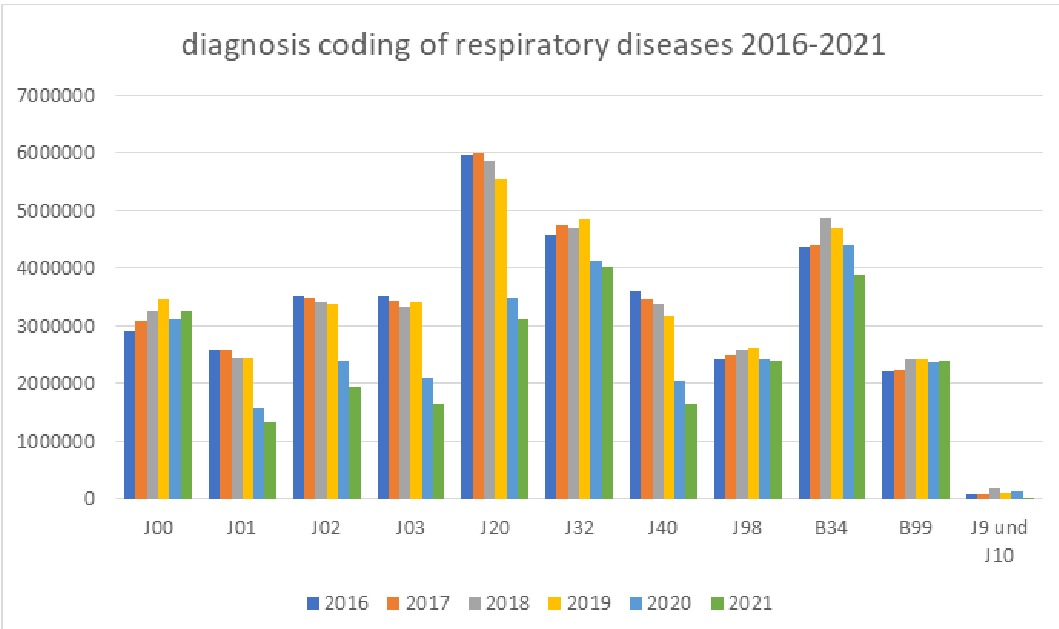

Figure 4: Statistics on the Diagnosis Coding of Respiratory Diseases 2016-2021

Also by far the most frequently encrypted ICD for respiratory diseases, the J06 (acute infections at several or unspecified localizations of the upper respiratory tract) shows no significant changes in the years 2016 to 2021.

In summary, there will be a significant reduction in influenza in 2021 without any significant changes in other respiratory infections.

4. Discussion

The premature end of the 2019/2020 influenza season and the almost complete absence of the 2020/2021 influenza season was registered both in Germany and in Europe [5-8, 22]. These studies show that COVID-19 containment measures and general behavioral changes in the population have likely had an impact on the transmission of other infections. The main containment measures implemented in Germany were contact restrictions and mobility restrictions, and from mid-March 2020 schools and restaurants were closed and most sports and leisure activities were banned. Travel was also restricted and social distancing measures were ordered and monitored. In addition, the mask requirement was introduced at the end of April 2020.

The Covid-19 control measures also had a significant impact on the norovirus positivity rates [23]. Norovirus is highly contagious, being transmitted via the fecal-oral route, through contaminated hands, or by consuming contaminated food or water. Therefore, the sharp drop in norovirus positive cases observed in 2020 is explained by the closure of schools, restaurants and other facilities due to the Covid containment measures [23].

The noroviruses have a diameter of 28–35 nm and are also primarily transmitted through direct contact and droplet infection, which explains the reduction due to contact restriction measures [24]. Wu D et al. also explain the decline in chickenpox, herpes zoster, rubella and measles in China and de Miguel et al. the decline in foodborne infections and sexually transmitted diseases in Spain [11,12]. A decline in all infectious diseases has been described for Switzerland for the same reasons [13]. However, influenza and corona viruses differ only marginally in their properties and size. The coronavirus is described as a membrane-enveloped RNA virus with a spherical to pleomorphic shape and a diameter of 60 to 140 nanometers (nm) [25]. Similarly, the influenza viruses are globular or spherically ellipsoid (round to ovoid), occasionally also filamentous, enveloped virus particles with a diameter of 80 to 120 nm [26].

These similar epidemiological profiles and the same physico-chemical properties are essential for the probability of transmission [27]. Adenoviruses belong to the Adenoviridae family. They are non-enveloped, double-stranded DNA viruses with a diameter of 90–100 nm [28]. Parainfluenza and RS viruses belong to the Paramyxoviridae family, have a single-stranded RNA genome and are 120–200 nm in diameter [29]. Influenza viruses, but also adeno, parainfluenza and RS viruses are mainly transmitted by droplets that have a particle size of more than 5 µm, especially when coughing or sneezing, and via airborne transmission by so-called droplet nuclei that are smaller than 5µm.

In addition, transmission is possible through direct contact of hands with surfaces contaminated with virus-containing secretions and subsequent hand-mouth/hand-nose contact [27,30]. This suggests that there can be no significant differences between corona viruses and the other viral pathogens of respiratory infections, neither in size nor in the way of contamination, so that the isolated influenza gap is not sufficiently explained by the Covid containment measures. This assumption is also supported by the fact that our analyzes did not show a significant decrease in infections with the adenovirus or RS virus in 2020 and 2021. For this reason, the comprehensive Covid-19 control measures, including the obligation to wear masks, cannot be used as a significant reason for the reduction in influenza A and B, which Jefferson et al. confirm [31].

A hypothetical explanation for the general decline in respiratory diseases despite the SARS-CoV-2 pandemic would be the assumption that every person who supposedly tested positive had to go into quarantine for 14 days and then for at least 5 days and thus avoided medical treatment . However, the exorbitant increase in laboratory tests for both flu and SARS-CoV-2 speaks against this thesis. In addition, our evaluations of test billing according to EBM from 2020 show a strong correlation between these 3 fee items (32816, 32006, 32841). It can therefore be assumed that in a large number of patients both an influenza and a SARS-CoV-2 test were billed and thus also evaluated. This is also reflected in the increase in ICD encryption for respiratory diseases from 71,199,754 in 2021 compared to 55,919,358 in 2019. Influenza A and B was encrypted 112,424 times in 2019 and still 33,727 times in 2021.

The diagnostic details J09 and J10 contain mandatory laboratory evidence in addition to the obligation to report! Therefore, an under-recording of notifiable influenza cases on the part of the RKI's influenza working group must be regarded as the cause, which can be understandable given the exceptional pandemic situation. Heinzinger et al. bring the aspect of underreporting of influenza cases into the discussion. During the 2019/2020 flu season, 58 doctors from 42 of 76 counties and from all seven administrative districts in Bavaria took part in the Bavarian Influenza Sentinal (BIS). In 2020/2021 there were only 41, a decrease of 30%. Even taking into account the submissions, there is a significant drop in the number of samples from 1376 in 2019/2020 to just 470 in 2020/2021, which corresponds to a minus of 65%. Possible reasons for lower submissions are a work overload of doctors due to the Covid-19 pandemic and a drop in demand from patients, who may have contacted a test center directly without consulting their general practitioner [8]. Furthermore, the weekly reports of the RKI from the second quarter of 2020 no longer contain any projections of flu cases for the entire German population, which was previously carried out regularly [14].

In summary, the decline in influenza A and B from the 2019/2020 season is based on a reduction in notifications in the sentinel practices system, the significant under-recording by the RKI and the general significant decrease in respiratory diseases - certainly also due to the corona pandemic and the associated containment measures. For this reason, the reporting quantity of the sentinal practices should be taken into account in the evaluations of the Influenza Working Group and the recording of incapacity diagnoses, which have been available in real time since January 1st, 2023, should also be taken into account.

Conflict of Interest

The authors have no conflict of interest.

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Appendix of the Key Numbers Respiratory Diseases:

J00 Acute rhinopharyngitis [common cold]
J01 Acute sinusitis
J01.0 Acute maxillary sinusitis
J01.1 Acute frontal sinusitis
J01.2 Acute ethmoidal sinusitis
J01.3 Acute sphenoidal sinusitis
J01.4 Acute pansinusitis
J01.8 Other acute sinusitis
J01.9 Acute sinusitis, unspecified
J02 Acute pharyngitis
J02.0 Streptococcal pharyngitis
J02.8 Acute pharyngitis caused by other specified pathogens
J02.9 Acute pharyngitis, unspecified
J03 Acute tonsillitis
J03.0 Streptococcal tonsillitis
J03.8 Acute tonsillitis caused by other specified pathogens
J03.9 Acute tonsillitis, unspecified
J06 Acute infections at multiple or unspecified sites of the upper respiratory tract
J06.0 Acute laryngopharyngitis
J06.8 Other acute infections at multiple sites of the upper respiratory tract
J06.9 Acute upper respiratory tract infection, unspecified
J09 Influenza caused by zoonotic or pandemic influenza viruses
J10 flu caused by seasonally detected influenza viruses

J10.0 influenza with pneumonia, seasonal influenza viruses detected
J10.1 Influenza with other respiratory manifestations, seasonal influenza viruses detected
J10.8 Influenza with other manifestations, seasonal influenza viruses detected
J20 Acute bronchitis
J20.0 Acute bronchitis caused by Mycoplasma pneumoniae
J20.1 Acute bronchitis caused by Haemophilus influenzae
J20.2 Acute streptococcal bronchitis
J20.3 Acute bronchitis due to coxsackieviruses
J20.4 Parainfluenza virus acute bronchitis
J20.5 Acute bronchitis due to respiratory syncytial viruses [RS viruses]
J20.6 Acute bronchitis due to rhinovirus
J20.7 Acute bronchitis due to ECHO viruses
J20.8 Acute bronchitis caused by other specified pathogens
J20.9 Acute bronchitis, unspecified
J32 Chronic sinusitis
J32.0 Chronic maxillary sinusitis
J32.1 Chronic frontal sinusitis
J32.2 Chronic ethmoid sinusitis
J32.3 Chronic sphenoidal sinusitis
J32.4 Chronic pansinusitis
J32.8 Other chronic sinusitis
J32.9 Chronic sinusitis, unspecified
J40 Bronchitis not classified as acute or chronic
J98 Other respiratory diseases
J98.0 Diseases of the bronchi, not elsewhere classified
J98.1 Lung collapse
J98.10 Dystelectasis
J98.11 Partial atelectasis
J98.12 total atelectasis
J98.18 Other and unspecified collapsed lung
J98.2 Interstitial emphysema
J98.3 Compensatory emphysema
J98.4 Other lung changes
J98.5 Disorders of the mediastinum, not elsewhere classified
J98.50 Mediastinitis
J98.58 Other mediastinal disorders, not elsewhere classified
J98.6 Diseases of the diaphragm
J98.7 Respiratory tract infection, not elsewhere classified
J98.8 Other specified respiratory diseases
J98.9 Respiratory disease, unspecified
B34 viral disease of unspecified localization
B34.0 Infection by adenoviruses of unspecified localization
B34.1 Infection by enteroviruses of unspecified localization
B34.2 Infection by corona viruses of unspecified localization
B34.3 Infection by parvoviruses of unspecified localization
B34.4 Infection by papovaviruses of unspecified localization
B34.8 Other viral infections of unspecified localization
B34.9 Viral infection, unspecified
B99 Other and unspecified infectious diseases
U07 diseases with unclear etiology, allocated and unallocated key numbers
U07.0 Health disorder related to e-cigarette use
U07.1 COVID-19, virus detected
U07.2 COVID-19, virus not detected
U07.3 Personal history of COVID-19, unspecified
U07.4 Post-COVID-19 state, unspecified
U07.5 Multisystem inflammatory syndrome associated with COVID-19, unspecified
U07.6 Need for immunization against COVID-19
U07.7 COVID-19 vaccines causing adverse effects in therapeutic use
U07.8 Emergency use of U07.8
U07.9 Emergency use of U07.9
U99.0 Special procedures for screening for SARS-CoV-2
U99.1 Unassigned key number
U99.2 Unassigned key number
U99.3 Unassigned key number
U99.6 Unassigned key number
U99.7 Unassigned key number
U99.8 Unassigned key number
U99.9 Unassigned key number