The Number of Influenza Risk Factors Informs an Adult's Increased Potential of Severe Influenza Outcomes: A Multi-Season Cohort Study from 2015 to 2020.

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Background: While studies have evaluated individual factors influencing the risk of severe influenza outcomes, there is limited evidence on the additive impact of having multiple influenza risk factors and how this varies by age.

Methods: Patients ≥18 years of age in the US were evaluated retrospectively in five seasonal cohorts during the 2015–2020 influenza seasons. Patient-level electronic medical records linked to pharmacy and medical claims were used to ascertain covariates and outcomes. Multivariable logistic regression models were fitted for the overall population and age subgroups to evaluate the association of demographic and clinical characteristics with odds of influenza-related medical encounters (IRME) (ICD-10 codes J09*–J11*). The logistic regression models included sex, race/ethnicity, geographic region, baseline healthcare resource use, vaccination status, specific high-risk comorbidities, number of influenza-risk factors, BMI, and smoking status. Odds ratios (OR) from each of the five individual seasons were summarized using fixed-effects meta-analysis.

Results: Season cohort sizes ranged from 887,260 to 3,628,168 individuals. Of all patient characteristics evaluated, the cumulative number of CDC-defined high-risk influenza conditions that an individual had was most predictive of increased probability of having an IRME overall and across age groups, with adults of any age with ORs for influenza hospitalization ranging from 1.8...
(95%CI: 1.7 to 2.0) for 1 risk factor up to 6.4 (95%CI: 5.8 to 7.0) for individuals with ≥4 risk factors.

**Conclusion:** These results show that a simple measure like the number of influenza risk factors can be highly informative of an adult’s potential for severe influenza outcomes.

**Key words:** Influenza, adult, comorbidity, hospitalization, risk

**INTRODUCTION**

Seasonal influenza presents a heavy burden to the US healthcare system, and in the five seasons between 2015 and 2020, it was estimated to be the cause of 11–21 million medical visits, 280,000–710,000 hospitalizations, and 23,000–52,000 deaths annually.¹ Certain subgroups of the population are at particular risk of severe outcomes due to an influenza infection. Among adults, the US Centers for Disease Control and Prevention (CDC) defines these risk factors as including age of 65 years and older, specific high-risk medical conditions, certain racial and ethnic backgrounds (Black, Hispanic, and American Indian and Alaska Native), pregnancy, and living in a residential care setting.²³ While several studies have evaluated how older age and the presence of at least one high-risk condition or individual specific risk factors influences the risk of severe influenza outcomes,⁴⁻⁷ there is limited evidence on the potential additive impact of having multiple high-risk conditions and how this effect may vary by age.⁸ Identifying which individuals are at increased risk of influenza can be informative for individual and program-level decisions on influenza vaccination. Evaluating the potential additive impact of having multiple risk factors further improves the ability to identify those most at risk and thus can result in more informed decision making.

This study assessed how the number of US-CDC defined high-risk conditions was associated with the odds of having an influenza outpatient visit, emergency room (ER) visit, or hospitalization in the overall adult population and among different age subgroups. In addition, this study also evaluated how select individual demographic and clinical characteristics are associated with the odds of medically-attended influenza in the overall adult population and among different age subgroups.

**METHODS**

**Study design**

We conducted a retrospective, observational cohort study evaluating risk factors related to the odds of having an influenza-related medical encounter (IRME). IRMEs evaluated included influenza-related outpatient visits (e.g., general practitioner visit), ER visits, or hospitalizations. Risk factors for influenza-related medical encounters (IRME) were assessed in five independent retrospective

**Data sources**

This study leveraged an integrated dataset of outpatient electronic health records (EHR) linked to closed medical and pharmacy claims data. This dataset included US outpatient EHR data from the Veradigm Network EHR, along with outpatient, inpatient, and pharmacy claims data from Komodo Health. The data used in the 2015–2016 season may be incomplete because while enrollment data was available prior to 2015, claims data prior to 1/1/2015 were not available.

**Study population**

Each of the five influenza seasons was treated as a separate retrospective cohort, with cohort selection, baseline characteristic assessment, and outcome assessment occurring independently for each season. Hence, individuals potentially contributed to one or more of the seasonal assessments.

This study included all individuals ≥18 years old at the start of the influenza season and who met the following criteria. First, they must have EHR activity at least 1 year prior to the start of the influenza season and during the influenza season. An influenza season was defined as week 40 of one calendar year through week 20 in the subsequent calendar year. In the 2019–2020 season, we truncated the influenza season at the end of week 10 (March 7, 2020) to avoid complications in the analysis due to the potential widespread circulation of the SARS-CoV-2 virus. Second, individuals have continuous claims enrollment from 1 year prior to the start of each influenza season to at least 120 days after the end of each influenza season. We excluded individuals with missing gender or geographic data and those who had an IRME during the off-season period (i.e., during the 19-week period between the end of the previous influenza season and the start of the subsequent influenza season). Individuals who met the above criteria were stratified by age at the start of the season into one of three categories (18–49 years, 50–64 years, and ≥65 years).

**Explanatory variables**

Demographics and medical history were evaluated during a one-year baseline period that spanned epidemiology week 40 in the calendar year preceding the start of the influenza season through week 39, just before the start of the influenza season (Supplementary Figure 1). For each individual, we captured the following demographic characteristics: age at the start of the influenza season, sex, race (Asian, Black, White, other, unknown), ethnicity (Hispanic or non-Hispanic), and geographic region (Northeast, Midwest, South, West, unknown). We evaluated several measures of healthcare resource use during the off-season period, including the number of individuals with an outpatient visit, the number of outpatient visits, the number of individuals with an ER visit, the number of ER visits, the number of individuals with a hospitalization, and the number of hospitalizations. Vaccination status was captured if it occurred during the influenza season and was recorded in outpatient or claims records. Although vaccination status was included
as a covariate in all of the models, vaccine effectiveness was not evaluated. This is because the vaccine coverage levels in this dataset compared to that reported by the CDC suggest that there may be a high proportion of individuals with missing influenza vaccination data, potentially due to vaccinations that occur outside of a medical care setting, such as on-site work vaccination clinics. Due to this misclassification of vaccine exposure status, vaccine effectiveness would likely bias towards the null.

Clinical characteristics evaluated included the Charlson comorbidity index (CCI),\textsuperscript{10} measures of baseline cardiovascular risk (cardiac hospitalizations during the baseline period), smoking history, and US CDC-defined influenza risk factors that increase an individual’s risk of severe outcomes following an influenza infection\textsuperscript{3}, as listed in Supplementary Table 1. The included CDC-defined influenza risk factors are asthma, neurologic and neurodevelopmental conditions, blood disorders, chronic lung disease, endocrine disorders (e.g., diabetes), heart disease, kidney diseases, liver diseases, metabolic disorders (e.g., inherited metabolic disorders, mitochondrial disorders), obesity (body mass index [BMI] of 40 or higher), weakened immune system due to disease or treatment, and stroke. An individual was considered to have a given high-risk condition if they had one or more diagnoses consistent with that disease during the baseline period (based on ICD-10 codes). The CDC considers only those with a BMI ≥40 to be at higher risk, however the upper cutoff for BMI included in this study was BMI ≥30 due to the limited number of individuals with a BMI ≥40. Although age of ≥65 years is considered a risk factor by the US CDC, it was not included as a risk factor in this analysis to improve comparability to other age groups. Other US CDC-defined influenza risk factors, including certain racial and ethnic backgrounds, pregnancy, and living in a residential care setting were not included due to insufficient data to accurately assess the presence of those risk factors. While race and ethnicity were included in the study, they were not included in the risk factor count because the race categories included in the database did not allow us to identify American Indian or Alaskan Native individuals (which were 2 of the 3 CDC defined high risk racial groups, along with Black individuals) and 15-30% of included individuals had missing race information.

For the assessment of BMI on odds of having an IRME, healthy wright individuals (BMI 18.5–24.9) were compared underweight (BMI <18.5), overweight (BMI 25.0–29.9) and obese (BMI ≥30) individuals. For smoking history, patients that never smoked were compared to current and former smokers (among those with a smoking history recorded in their EHR).

In addition to the presence of individual CDC-defined risk factors, we also calculated the total number of CDC-defined risk factors that an individual had. For each season they were eligible for, individuals were classified as having 0, 1, 2, 3, or ≥4 risk factors based on the number of CDC-defined high-risk conditions diagnoses in the baseline period for that season. The number of risk factors was capped at ≥4 based on a preliminary assessment that found relatively few individuals with ≥5 risk factors. If an individual had more than one diagnosis in a single risk factor category (e.g., two diagnoses related to liver disease), that was still only considered to indicate the presence of a single risk factor. Demographic and clinical characteristics other than the CDC-defined high-
risk conditions did not contribute towards the count of the number of risk factors an individual had.

Outcome variables

The outcomes of interest were influenza-related outpatient visits, ER visits, or hospitalization. Influenza-related outpatient visits were identified using EHR and claims data. Because the underlying EHR data was limited to the outpatient setting, influenza-related ER visits and inpatient hospitalizations were identified from claims only. We considered ER visits that occurred on the same day or on the day preceding a hospitalization to be part of the hospitalization. The codes we used to identify influenza diagnosis included International Classification of Diseases (ICD), 9th Edition, Clinical Modification codes 487.x and 488.x, along with ICD-10 codes J09*, J10*, and J11*.

Data analysis

Cohort characteristics are summarized descriptively by counts and percentages for categorical variables and means and standard deviations (SD) for continuous variables. Medians and interquartile ranges (IQR) are reported for select continuous variables. We assessed differences in baseline characteristics between individuals 50–64 years old compared to those 18–49 or ≥65 years old using standardized mean differences (SMD). SMDs >|0.1| were considered meaningful differences.

The association of explanatory variables with IRMEs was evaluated in overall age groups and age-stratified logistic regression models. Due to the large number of effect estimates generated, as a post-hoc analysis, odds ratios from the five seasons were summarized using fixed-effect meta-analysis to better understand general trends across the seasons. A fixed effect model was used (rather than a random effects model) because it was assumed that, despite season to season variation in the severity of influenza seasons, any given risk factor would likely convey a more fixed proportionate impact on risk of a severe outcome following an influenza infection.

Descriptive statistics and logistic regression models were generated using SAS V9.4 (SAS Institute, Cary, NC). R V4.2.2 (R Foundation for Statistical Computing, Vienna, Austria) was used for data visualization and post-hoc meta-analyses using the package ‘meta.’

Quality and Ethics

The study was designed, implemented, and reported in accordance with Good Pharmacoepidemiological Practice, applicable local regulations, and the ethical principles laid down in the Declaration of Helsinki. The study findings have been reported according to the Reporting of Studies Conducted using Observational Routinely Collected Health Data (RECORD) recommendations. This linked EHR and claims dataset has been certified as statistically de-identified through a formal determination by a qualified expert as defined in Section
$\S 164.514(b)(1)$ of the Health Insurance Portability and Accountability Act of 1996 (HIPAA) Privacy Rule.

RESULTS

The final study population included 887,260 individuals in the 2015–2016 season, 2,789,372 in the 2016–2017 season, 3,202,455 in the 2017–2018 season, 3,628,168 in the 2018–2019 season, and 3,310,936 in the 2019–2020 season (Supplementary Table 2). Within these populations, 37.8%–44.3% were included in the 18–49 years old cohorts, 33.5%–38.6% in the 50–64 years old cohorts, and 17.2%–28.7% in the ≥65 years old cohorts across seasons.

Baseline characteristics are reported by season and by age group in Supplementary Table 3. In all seasons, there tended to be a higher percentage of females in the 18–49 cohort compared to the 50–64 cohort (SMDs: -0.130 to -0.111). Among individuals 18–49 years old, a median of 63.6% were female, while among those 50–64 or ≥65 years old, a median of 57.5% or 57.2% were female, respectively. The majority of individuals in all seasons and age groups were White and non-Hispanic.

The majority of individuals over 50 years of age suffered from high-risk conditions (Figure 1). The percentage of individuals with at least one risk factor increased with age from a median of 37.7% among individuals 18–49 years old to 61.5% for individuals 50–64 years old to 79.7% among those ≥65 years old (Supplementary Table 3). The percentage of individuals with at least four high-risk conditions increased with age from a median of 3.7% among individuals 18–49 years old to 9.9% of individuals 50–64 years old and 20.4% of individuals ≥65 years old. Other measures that indicated baseline health status decreased with age included greater use of healthcare services in the outpatient setting during the off-season period, higher CCI, and higher prevalence of specific high-risk comorbidities (Supplementary Table 3).

Association Between the Cumulative Number of CDC-defined Risk Factors and IRME

All results are from the meta-analysis and reported as odds ratios with 95% confidence intervals (OR [95% CI]). Unless otherwise stated, all reported odds ratios are for the overall population of individuals ≥18 years old.

In the overall population, individuals with conditions that were CDC-defined risk factors had a higher odds of having an influenza-related outpatient visit, ER visit, or hospitalization compared to individuals having zero high-risk conditions (Figure 2). In addition, the odds of having an influenza-related outpatient visit increased with the number of risk factors (1 condition: 1.16 [1.14 – 1.17]; 2 conditions: 1.35 [1.33 – 1.37]; 3 conditions: 1.51 [1.48 – 1.54]; ≥4 conditions: 1.83 [1.77 – 1.88]). The trend of the odds and confidence interval increasing with every added risk factor was also observed for influenza-related ER visits (1: 1.45 [1.41 – 1.50]; 2: 1.91 [1.84 – 1.98]; 3: 2.39
The same trend of an increase in odds of IRMEs with an increasing number of risk factors was observed in each age group (Figure 2). The effect of an increasing number of risk factors on the increasing odds of influenza-related ER visits and hospitalizations was most pronounced for individuals 50–64. Notably, the differences across age groups with the same number of risk factors were smaller than the differences across risk factor groups of the same age. This suggests that the number of CDC-defined clinical risk factors is a more significant driver of IRME than age.

**Non-clinical Risk Factors for IRME**

As in the prior section, all results are for the overall population unless otherwise stated. Figure 3 shows that compared to individuals 50–64 years old, those aged 18–49 had a higher odds of outpatient (1.50 [1.48 – 1.51]) and ER visits (1.66 [1.62 – 1.70]) but a lower odds of hospitalization (0.72 [0.69 – 0.76]). By comparison, compared to those 50–64 years old, individuals aged ≥65 years had a higher odds of hospitalizations (1.37 [1.32 – 1.42]) and a lower odds of outpatient (0.58 [0.57 – 0.58]) and ER visits (0.88 [0.86 – 0.91]).

Relative to males, females had increased odds of influenza-related outpatient visits (1.10 [1.09 – 1.11]) and ER visits (1.24 [1.21 – 1.26]) but not hospitalizations (1.03 [1.00 – 1.07]; Supplementary Figure 2). Hispanic individuals had higher odds of having an influenza-related outpatient visit (1.12 [1.11 – 1.14]), ER visit (1.50 [1.46 – 1.55]), or hospitalization (1.15 [1.09 – 1.22]) compared to non-Hispanic individuals (Supplementary Figure 3). Several significant differences in the odds of IRME were observed between racial groups (Supplementary Figure 4), with the largest difference observed between Black individuals and White individuals. Specifically, Black individuals had a lower odds of an outpatient visit (0.70 [0.68 – 0.71]) but a higher odds of an ER visit (1.68[1.63 – 1.72]) or hospitalization (1.18 [1.12 – 1.24]) compared to White individuals.

All models also adjusted for geographic region to account for potential geographic differences in health status (Supplementary Figure 4). Geographic differences in odds of IRME likely represent differences in healthcare availability and healthcare-seeking behavior rather than true differences in the risk of having an influenza infection.

**Individual Clinical Risk Factors for IRME**

Use of healthcare services in a specific setting during the off-season period was associated with a higher odds of using services in that same setting for their influenza care compared to individuals who did not receive care in that setting (Supplementary Figure 5). For example, individuals who had an outpatient visit in the off-season had a higher odds of an influenza-related outpatient visit compared to individuals who did not have an outpatient visit during the off-season (1.42 [1.41 – 1.44]), whereas individuals who had a hospitalization during the off-season had a lower odds of
an influenza-related outpatient visit compared to individuals who did not have a hospitalization during the off-season (0.87 [0.85 – 0.89]). In contrast, individuals who had a hospitalization during the off-season period had increased odds of having an influenza-related hospitalization compared to individuals who did not have a hospitalization during the off-season (1.96 [1.88 – 2.05]). In addition, for individuals who had a hospitalization in the off-season, the odds of an influenza-related hospitalization decreased with age (18–49: 4.03 [3.64 – 4.45]; 50–64: 2.25 [2.09 – 2.44]; ≥65: 1.34 [1.26 – 1.44]). The increased likelihood of returning to the same clinical setting may be due to a combination of healthcare-seeking behavior/access and individual health status.

A one-unit increase in CCI value was associated with a decreased odds of having an influenza-related OP visit (0.96 [0.95 – 0.96]) and an increased odds of an influenza-related ER visit (1.04 [1.03 – 1.05]) or hospitalization (1.11 [1.10 – 1.12]) (Supplementary Figure 6). In the overall population, metabolic disorders and type 2 diabetes were associated with a decreased odds of IRME, while systemic lupus erythematosus (SLE) and rheumatoid arthritis were associated with increased odds of IRME. However, the trends for diabetes and SLE not consistent and/or significant in all age subgroups.

A baseline hospitalization for ischemic stroke was associated with a decreased odds of any type of IRME, whereas a baseline hospitalization for heart failure or a diagnosis of hypertension was associated with an increased odds of an influenza-related ER visit or hospitalization (Supplementary Figure 7). Baseline hospitalizations for myocardial infarction or transient ischemic attacks were not associated with increased or decreased odds of IRME. No consistent age-related trends were observed among measures of cardiac health, though confidence intervals were wide due to the low incidence of cardiac-related baseline hospitalizations.

Using CDC standard cutoffs for BMI, underweight individuals had a higher odds of having an influenza-related ER visit (1.24 [1.13 – 1.35]) or hospitalization (1.50 [1.31 – 1.71]) compared to those with a BMI in the healthy weight range (Supplementary Figure 8). By contrast, when comparing healthy weight BMI individuals to overweight or obese individuals, elevated BMI was associated with a decreased odds of influenza-related hospitalization (Overweight: 0.86 [0.81 – 0.91]; obese: 0.88 [0.83 – 0.93]) individuals had decreased odds of hospitalization for influenza compared to healthy weight individuals. Trends were generally consistent across age groups, though not always statistically significant.

Compared to individuals who never smoked, current smokers had a decreased odds of an influenza-related outpatient visit but an increased odds of an influenza-related ER visit (1.24 [1.17, 1.31]) or hospitalization hospitalizations (1.21 [1.10, 1.34], Supplementary Figure 9). Effect sizes were smaller but followed the same trends when former smokers were compared to those who never smoked. Individuals with unknown smoking status had marginally increased odds of an IRME compared to those who had never smoked. There were no clear trends between age, smoking status, and odds of IRME.

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DISCUSSION

In this analysis of five consecutive influenza seasons adults with CDC-defined clinical risk factors were more likely to have an IRME compared to those with no risk factors across all age groups. The likelihood of having an IRME increased with the cumulative number of risk factors for all three outcomes (influenza-related outpatient visits, ER visits, and hospitalizations) and was significant even among individuals with only one risk factor. The effect of additional risk factors on influenza-related ER visits and hospitalizations was observed in all age groups, though most pronounced among individuals 50–64 years old. Other notable trends included that, relative to individuals 50–64 years old, younger individuals (18–49 years old) had a higher odds of influenza-related outpatient and ER visits, while older individuals (≥65 years old) had a higher odds of influenza-related hospitalizations. Trends among clinical and non-clinical risk factors were of a smaller magnitude or less consistent across age groups than for the cumulative number of risk factors indicating that the number of CDC-defined clinical risk factors appears to be a more significant driver of IRME than age.

It has been well established that older individuals and those with select comorbidities are at higher risk of severe influenza.\(^4\)\(^-\)\(^6\) For example, in an analysis of influenza-related hospitalizations in England and Wales, both older age and clinical risk (≥1 high-risk comorbidity) were associated with a high incidence of hospitalization and death.\(^4\) There is less known about how the risk of medically-attended influenza is influenced by multi-morbidity. It has been estimated that over 25% of US adults and over 50% of those over the age of 65 have at least two chronic conditions,\(^15\) and the prevalence of multi-morbidity has been increasing over time.\(^16\),\(^17\) Although age is a strong predictor of multi-morbidity, 23.7% of individuals 30–64 reported at least two chronic conditions in the National Health Interview Survey,\(^18\) and roughly 20% of individuals 18–49 years old in this study had at least two risk factors.

Influenza vaccination is the best solution to prevent influenza and associated complications. While the decision to receive an influenza vaccine or not remains an individual’s decision, being able to identify individuals at increased risk of influenza can help guide individual and program levels decision about influenza vaccination. It can also help direct resources for informational or outreach programs intended to improve influenza vaccination by focusing on those most at risk. The additive impact of multi-morbidity on the likelihood of having influenza demonstrated in this study improves the ability to identify patients most at risk and provides a simple measure that may resonate with healthcare providers and their patients.

Limitations and Strengths

One limitation of this study was that the claims data had a start date of 1/1/2015, resulting in a smaller sample size in the 2015–2016 season and incomplete baseline data for the 2015–2016 cohort. As a consequence, we may be underestimating the number of high-risk conditions among...
individuals in the 2015–2016 season; however, the potential for bias has been reduced by the use of a fixed-effects meta-analysis to estimate the effect size.

Another limitation is that certain CDC-identified risk factors for complications of influenza infection were not available or have low completeness in the data source. These include people living in a nursing home or other long-term care facility and people from certain racial or ethnic minority backgrounds. In addition, we used a BMI of ≥30 as the highest BMI category; however, the CDC identifies Class III obesity (BMI ≥ 40) as a risk factor for influenza. This may have reduced our ability to detect the effect of obesity on the odds of medically attended influenza.

In the analysis of the impact of the number of CDC-defined risk factors on odds different IRMEs, we adjusted for the presence of specific individual risk factors, which can help adjust for imbalances in specific conditions that contributed to that count. However, it is possible that specific combinations of risk factors had a greater combined impact than would be assumed based on the effect of the individual risk factors, which wouldn’t be completely adjusted for.

When stratifying the different analyses by age group, any of the comparisons made were among that specific age group. For example, when comparing those 0 vs 1 risk factor in an age group, it would only be among people in that specific age strata. There are likely health differences between age groups, even among people with a specific number of risk factors, which limits our ability to directly compare the impact of any given risk factor between age groups.

A final limitation is that this study is measuring influenza healthcare encounters and not influenza infections, and healthcare-seeking behavior may vary depending on demographic and clinical characteristics. For example, prior studies have found that smokers were less likely to use primary care services19 and individuals with comorbidities were more likely to seek care for influenza-like illnesses.20 This study also found that current/former smokers were less likely to have an outpatient visit for influenza (but increased likelihood of ER visits or hospitalization). The lower likelihood of having an influenza related outpatient visit among current/former smokers likely represents current/former smokers being less likely to seek care in general and not a reduction in their likelihood of having a symptomatic influenza infection.

The strengths of our study include the use of data from a large, geographically distributed population. In addition, we took steps to increase data completeness by using linked EHR and claims data and restricting to individuals with known age, gender, and geography. Finally, the analysis was repeated across 5 seasons, and the effect size was estimated using a fixed-effects meta-analysis.

**CONCLUSIONS**

In the current study, we observed a clear trend towards increased odds of IRME with an increasing number of high-risk comorbidities. These results show that in any age group, a simple measure
like the number of CDC influenza risk factors can be highly informative of an individual’s potential for severe influenza outcomes and may be informative for individual and program-level decisions on preventive measures, including influenza vaccination.

Disclosures

Author contributions. I. M. and M. H. contributed to study conceptualization. All authors contributed to study design, analysis, and interpretation. K.C. and A. B. contributed to data collection and data processing. I. M. led development of the first draft of the manuscript. All authors revised the paper critically, made substantive intellectual contributions to the development of this manuscript, and approved the final version.

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Potential conflicts of interest. I. M. and M. H. are employees of CSL Seqirus. K. C. and A. B. work for Veradigm, a company that was contracted by CSL Seqirus and received a research contract to conduct this study with and on behalf of CSL Seqirus.

Patient Consent Statement. The linked EHR and claims dataset used in this study has been certified as statistically de-identified through a formal determination by a qualified expert as defined in Section §164.514(b)(1) of the Health Insurance Portability and Accountability Act of 1996 (HIPAA) Privacy Rule. Because this study used only de-identified patient records, it is therefore no longer subject to the HIPAA Privacy Rule and is therefore exempt from institutional review board approval and for obtaining informed consent according to US law.

Data availability. The data that support the findings of this study were used under license from Veradigm and Komodo Health. Due to data use agreements and its proprietary nature, restrictions apply regarding the availability of the data. Further information is available from the corresponding author.

Key points: This descriptive study evaluated the association of patient characteristics and influenza-related medical encounters and found that a simple measure like the number of influenza risk factors can be highly informative of an adult’s potential for severe influenza outcomes.

References


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**Figure 1:** Median Percentage of Patients with High-Risk Conditions in the 2015–2016 Through 2019–2020 Seasons by Age Group
**Figure 2:** Number of High-Risk Conditions as a Risk Factor for Influenza-Related Outpatient Visits, Emergency Room Visits, and Hospitalizations. CI, confidence interval

**Figure 3:** Age as a Risk Factor for Influenza-Related Outpatient Visits, Emergency Room (ER) Visits, and Hospitalizations. CI, confidence interval; OR, odds ratio