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Short communication

Effect of the COVID-19 pandemic on adversity in individuals receiving anticoagulation for atrial fibrillation: A nationally representative administrative health claims analysis

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ABSTRACT

Background: Atrial fibrillation (AF) is strongly associated with clinical adversity, including increased hospitalization and bleeding and stroke events. We examined the effect of the SARS-2 Coronavirus 2019 (COVID-19) pandemic on such events in individuals with AF receiving oral anticoagulation.

Methods: We employed medical and pharmacy claims spanning 2018–2020 from a nationally representative U.S. database (IQVIA Longitudinal Prescription, Medical Claims, and Institutional Claims). We selected individuals receiving oral anticoagulation in 2018 for AF and followed them from 1/1/2019–7/8/2020 for clinical events. We constructed interrupted time-series analyses across 30-day intervals with Poisson regression models to determine the effect of the COVID-19 pandemic on clinical events.

Results: The dataset included 1,439,145 individuals (half with age ≥75 years; 47.6% women) receiving oral anticoagulation. We determined a 19% decrease in emergency room visits following the pandemic declaration and 8% decrease in inpatient admissions. In contrast admissions for stroke and bleeding were not affected by the declaration of the pandemic.

Discussion: These results describe the temporal effect of the COVID-19 pandemic on clinical adversity – hospitalizations, strokes, and bleeding events – in individuals receiving oral anticoagulation for AF. Our analysis quantifies the decrease in clinical adversity accompanying COVID-19 in a large, highly representative U.S. health claims database.

1. Introduction

Atrial fibrillation (AF) is the most commonly encountered clinical arrhythmia and its associated adversity includes increased risks of hospitalization and thromboembolic stroke. Oral anticoagulation, with either warfarin or a direct acting oral anticoagulant (DOAC), is the standard of care for stroke prevention in AF [1]. Those receiving anticoagulation face a residual risk of stroke and the additional risk of bleeding [2]. While the SARS Coronavirus 2019 (COVID-19) pandemic disrupted routine, elective care, we sought to understand the effect of the pandemic on clinical events in AF. Specifically, we quantified changes in hospitalizations, strokes, and bleeding events in individuals with AF, hypothesizing that such events – given their clinical adversity – would continue with the same frequency during the pandemic's first months as prior.

2. Methods

We obtained medical and pharmacy claims spanning 2018–2020 from IQVIA Longitudinal Prescription Claims, Medical Claims, and Institutional Claims Data. IQVIA Longitudinal Prescription Claims is a nationally representative database which captures approximately 90%

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[1] This author takes responsibility for all aspects of the reliability and freedom from bias of the data presented and their discussed interpretation.

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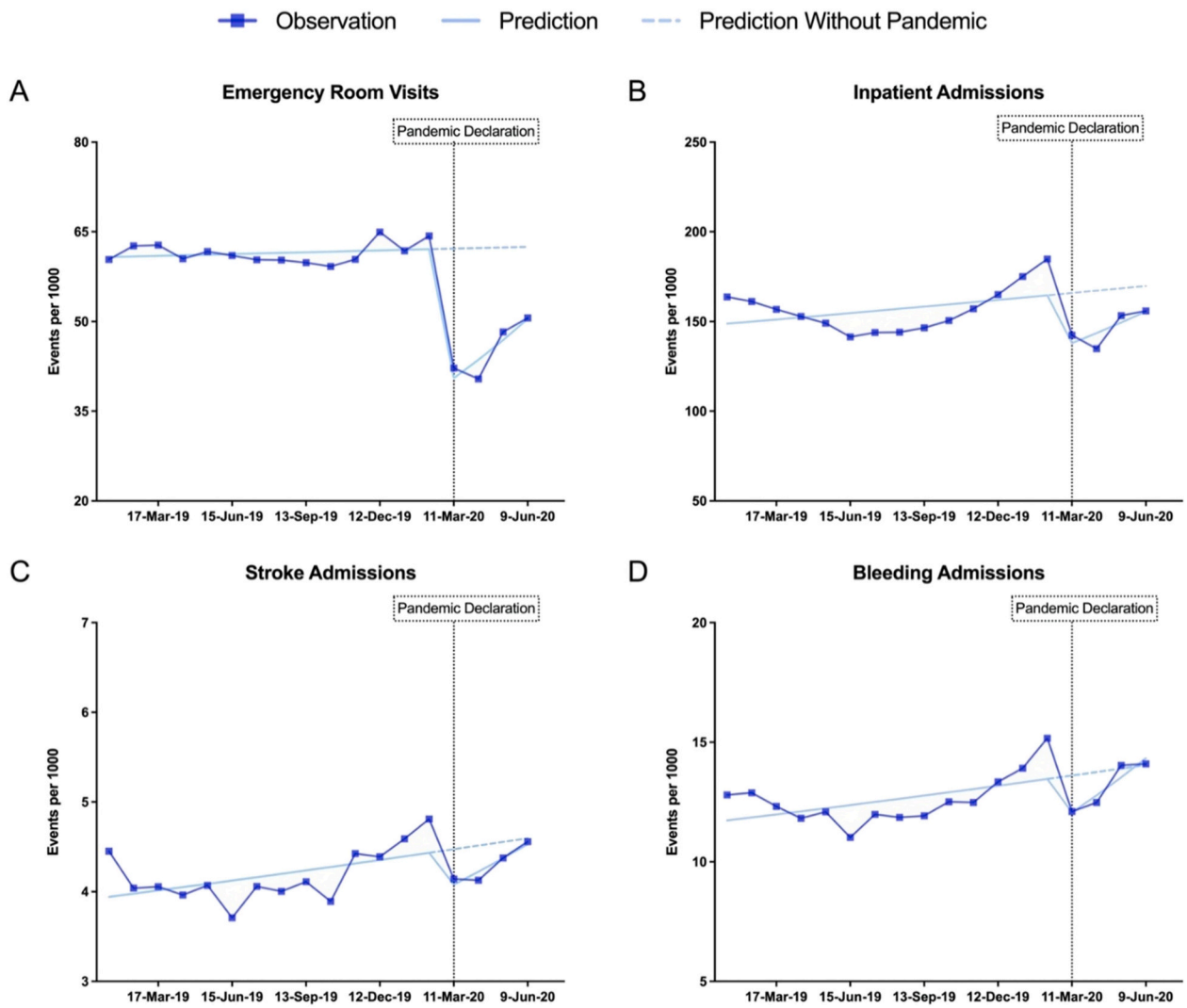

Fig. 1. Observed and predicted incidence of (A) emergency room visits; (B) inpatient admissions; (C) stroke admissions; and (D) bleeding admissions for 30-day intervals, January 2019–June 2020. Squares represent observed incidence. Solid lines represent the incidence of outcomes predicted with interrupted time series analyses. Dashed lines represent the incidence of outcomes predicted with interrupted time series analyses in the absence of pandemic, that is, as if there had been no changes in level or trend of outcomes after March 11, 2020.

of outpatient prescriptions, and the medical and institutional claims capture procedures and diagnoses in office-based and institutional settings [3,4]. The data span payment methods including commercial insurance, Medicare, Medicaid, and cash. Individuals are anonymized without access to individual-level identifiers.

We selected the study sample as described by Supplementary Fig. 1 with additional details in the Supplementary methods. We selected individuals receiving oral anticoagulation during 2018 and diagnosed with AF and followed them from 1/1/2019 through 07/08/2020.

We defined clinical events as any emergency room visits, all-cause inpatient admissions, and admissions with a diagnosis of stroke or bleeding. Supplementary Table 1 lists the ICD-10 codes used to define the outcomes.

Covariates included age and sex; congestive heart failure, hypertension, diabetes, stroke or transient ischemic attack, vascular disease, renal disease, and history of bleeding; specialty of the prescribing provider (general medicine, cardiovascular medicine, or other); index prescription payment type (cash, Medicaid insurance, Medicare insurance, or commercial insurance); and out-of-pocket costs spent on anticoagulation in the baseline year.

We reported the incidence of outcomes per 1000 study participants for each 30-day interval starting from January 1, 2019. We constructed interrupted time-series analyses with Poisson regression models to test changes in the level (intercept) and trend (slope) in the incidence of outcomes following the start of the COVID-19 pandemic as declared by the World Health Organization's on March 11, 2020. Multivariable-adjusted regression models included an intercept, a continuous variable for 30-day interval, an indicator variable for time after pandemic declaration, and their interaction. Regression models were adjusted for all covariates. We further tested whether changes in the incidence of outcomes after pandemic start varied by age group and index drug (DOAC compared to warfarin) by fitting interaction terms between age or index drug and changes in level and slope.

Based on the output from interrupted time series analyses, we reported the predicted incidence of each outcome per 30-day study period. We then estimated the predicted incidence of outcomes for each 30-day study period as if there had not been a change in the incidence of the outcomes following March 2020, thereby simulating that the COVID-19 pandemic had not occurred. All analyses were conducted with SAS 9.4 (Cary, NC). The Institutional Review Board at the University of Pittsburgh deemed this study as exempt from human subjects review.

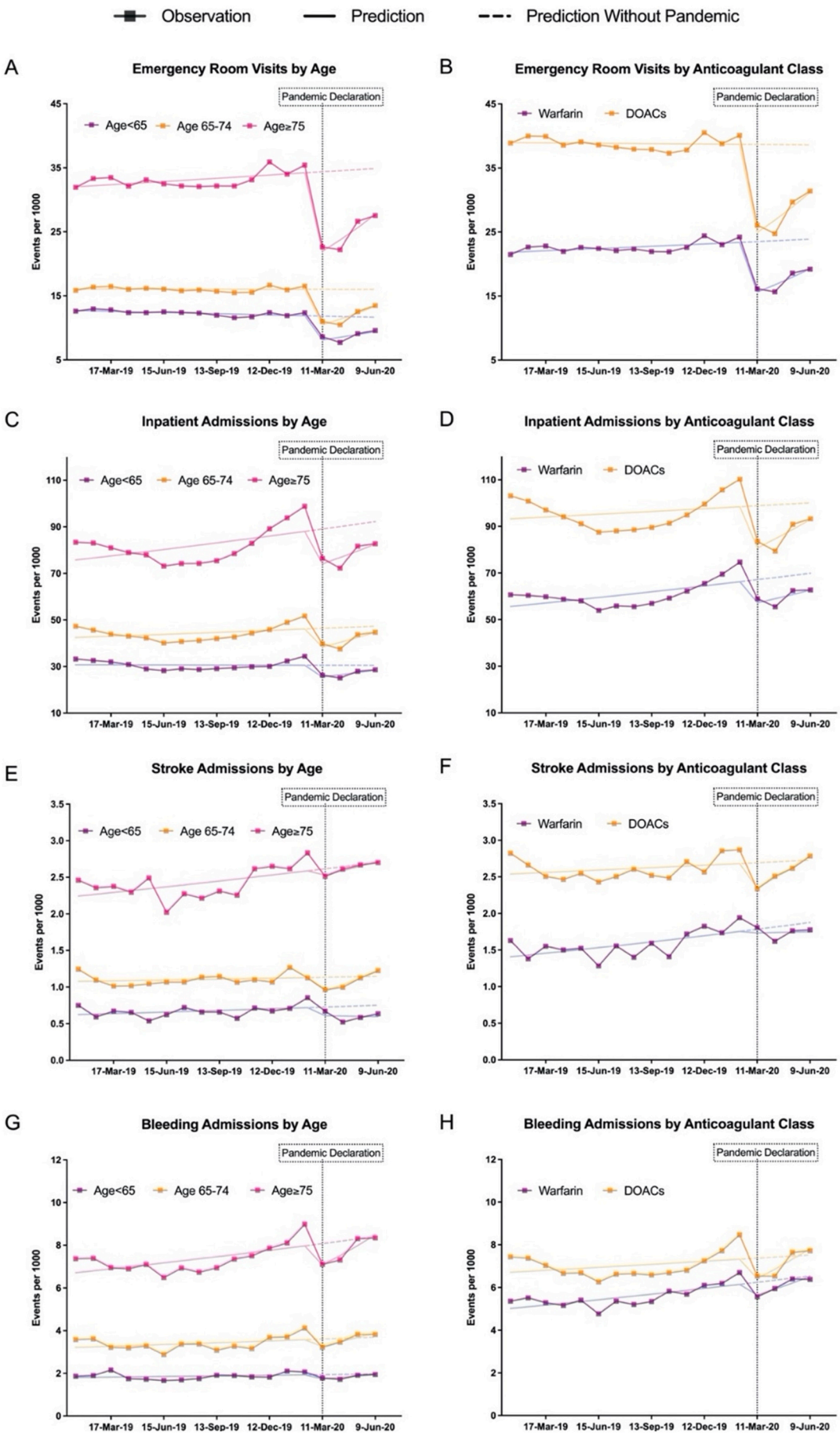

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Fig. 2. Observed and predicted incidence of outcomes by subgroup for (A, B) emergency room visits; (C, D) inpatient admissions; (E, F) stroke admissions; and (G, H) bleeding admissions for 30-day intervals January 2019–June 2020. Thick solid lines represent observed incidence. Thin solid lines represent the incidence of outcomes predicted with interrupted time series analyses. Dashed lines represent the incidence of outcomes predicted with interrupted time series analyses in the absence of pandemic, that is, as if there had been no changes in level or trend of outcomes after March 11, 2020.

3. Results

Supplementary Table 2 describes the final dataset of 1,439,145 individuals (over half age ≥75 years; 47.6% women). The most common index drugs were apixaban (38.3%) and warfarin (37%). Anticoagulants were prescribed foremost by cardiovascular specialists (45.5%) with most index prescriptions being covered by Medicare (70.4%).

Fig. 1 graphically presents the numbers of events per 1000 individuals across 30-day intervals spanning the observation period. Following the pandemic declaration, there was an abrupt decrease in emergency room visits (Fig. 1A). Supplementary Table 3 quantifies the significant decreases across all outcomes immediately after pandemic declaration except for admissions for stroke (p-values for level change<0.001). At the end of our study period (July 2020), the incidence of emergency room visits was 19% lower than expected and inpatient admissions 8% lower. In contrast, admissions for stroke or bleeding were not significantly different to levels expected in the absence of pandemic.

Fig. 2 presents the change in observed versus predicted events by subgroups of age (<65, 65–74, and ≥75 years) and anticoagulant class (warfarin versus DOAC). Of note, the decrease in the incidence of emergency room visits was more pronounced for those ≥75 years than the other age groups (Fig. 2A). The magnitude of the decreases in incidence of inpatient admission, stroke admission, and bleeding admission were larger for those ≥75 years (Fig. 2C, E, G), but the differences did not reach statistical significance. Supplementary Table 4 quantifies the differences in events by age subgroup across time-series regression analyses.

The decreases in the incidence of emergency room visits and hospital admissions were more pronounced among DOAC compared to warfarin users (p-value for interaction between OAC type and level change <0.01 for both outcomes) (Fig. 2B and D; Supplementary Table 4). There were no statistically significant differences in the changes in the incidence of stroke admission and bleeding admission after pandemic onset between DOAC and warfarin users.

4. Discussion

We quantified the temporal effect of the COVID-19 pandemic on clinical events – hospitalizations, strokes, and bleeding events – in individuals receiving oral anticoagulation for AF. We conducted our analysis in a large, nationally representative sample of health claims data which included over 1.4 million unique individuals. Our chief finding was the significant decrease in emergency visits and all-cause inpatient admissions, depicted graphically by Fig. 1. Our findings are distinctly contrary to our hypothesis, given our assumption that events in those receiving oral anticoagulation are both urgent and unplanned. Rather, these results suggest that the COVID-19 pandemic not only disrupted routine care, but also was associated with a decreased incidence of clinical events in individuals with AF.

Our findings suggest an unexpected effect of COVID-19, such that acute clinical events in AF decreased prominently as observed here. Other analyses have similarly reported decreased care for serious conditions at the onset of the pandemic, but lacked the generalizability of the data presented here and did not specifically focus on individuals receiving anticoagulation for AF [5,6]. Potential explanations for our findings include that individuals may have delayed hospital presentation at the onset of the pandemic [7]. We consider such an explanation insufficient given the calamitous nature of hospitalization events captured in individuals receiving anticoagulation as captured by this claims analysis. Further, our analyses indicate that the decrease in presentations continued for several months following the onset of the pandemic. Second, it is possible that social and environmental changes may have affected the likelihood of clinical events. Particulate matter, for example, is associated with stroke risk in individuals with AF [8]; decreased industrial exposures may likewise have contributed to the findings observed here, as individuals observed social distancing measures. A third potential possibility is that events were treated without accompanying hospitalization given the rapid increase in availability and use of virtual visits [9]. In sum, our results are intriguing as they indicate the broad impact of the pandemic on acute clinical health outcomes and the social costs of AF.

Our analysis has fundamental limitations. IQVIA lack data on individual- or hospital-level characteristics, which would be informative to identify differences in hospitalization events by race and ethnicity, region, or hospital size and type. Second, while IQVIA data do not have information on health plan disenrollment or death, we note that we excluded individuals with gaps in IQVIA claims exceeding 120 days, a standard approach in health services research to overcome this limitation. In addition the absence of mortality data precludes investigating the competing risk of mortality. Finally, we are not able to adjudicate diagnoses such as stroke and bleeding events. However, we expect coding for such events to be non-differential with respect to the timing and duration of the COVID-19 pandemic.

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Declaration of competing interest

Hernandez has received consulting fees from Pfizer and Bristol Myers Squibb, outside of the submitted work, and has served in an advisory board for Bristol Myers Squibb.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ahjo.2022.100096.

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