

hospital mortality. Over one-third of inpatients required post-hospital healthcare services. Such info may help healthcare providers better allocate resources to take care of COVID-19 patients during the pandemic.

IN2 CHARACTERISTICS OF PATIENTS DIAGNOSED WITH CORONAVIRUS DISEASE 2019 (COVID-19) ACROSS THE THREE WAVES IN THE US: A CLAIMS-BASED STUDY USING A LARGE NATIONAL SAMPLE

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Objectives: To assess how characteristics of patients diagnosed with COVID-19 have changed over the three waves in the US (April, July and November 2020) and evaluate the temporal relationship of disease severity. **Methods:** This retrospective database study used IQVIA's medical (Dx) and longitudinal prescription claims (LRx) databases. Patients with a new medical claim with a diagnosis code of COVID-19 (ICD-10-CM: U07.1) in April, July or November 2020 were identified (first diagnosis = index date). Demographics, comorbidities and prescriptions within 6-months pre-index and diagnoses (symptoms/complications) and healthcare resource utilization within 14-days pre- or post-index were descriptively assessed by index month. Logistic regression was used to evaluate adjusted odds of serious complication and hospitalization by index month. **Results:** The study sample comprised 1,401,309 patients diagnosed with COVID-19 (330,110 April/452,663 July/618,546 November). Half of April/July/November cohorts were female (53.5/56.0/53.7%) with mean age 57.4/47.3/50.1 years and mean CCI score 1.3/0.7/0.6. Region varied with 20.8/60.2/40.4% located in the South. The top 3 comorbidities were more common in April: hypertension (35.8/23.4/19.6%), T2DM (20.7/13.6/10.6%) and dyslipidemia (19.3/13.6/11.0%). Similarly, the top 3 symptoms were more common in April: cough (25.4/14.8/14.5%), fever (22.7/11.4/8.5%) and shortness of breath (19.8/11.3/9.9%). Pneumonia was the most common serious complication and highest in April (33.4/17.8/16.9%). Proportion with ER visit (42.1/36.1/32.4%) and hospitalization (32.5/17.3/14.7%) was highest in April; conversely, COVID-19 diagnostic testing (24.2/45.0/43.5%) was lowest in April. After adjusting for baseline characteristics, July/November cohorts were associated with 51.4/57.4% lower odds of pneumonia and 49.0/62.1% lower odds of hospitalization compared to the April cohort, respectively (all $p < 0.0001$). **Conclusions:** This research confirms that the underlying population contracting COVID-19 has changed over time. While new cases have increased, the burden and severity of illness appeared to be highest in April. These changing trends likely reflect improvements in the knowledge, treatment and management of the disease, as well as increased testing.



treatment capacity by increasing the percentage of available hospital bed-, ICU bed-, and total ventilator capacity.

IN4 NON-HEALTH CONSIDERATIONS IN ECONOMIC EVALUATIONS OF COVID-19 INTERVENTIONS: A SYSTEMIC REVIEW

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Objectives: To examine whether and how economic evaluations for COVID-19 interventions incorporate non-health impacts. **Methods:** Using pre-specified keywords, we searched the National Institute of Health's iSearch COVID-19 portfolio, containing both pre-prints and peer-reviewed articles, as our primary database to identify economic evaluations of COVID-19 interventions in December 2020. We retained studies that empirically evaluated economic as well as health consequences of COVID-19 interventions. We supplemented our search with additional sources, such as Google Scholar, COVID Scholar, EconLit, and NBER. Based on the Second Panel's "Impact Inventory," modified for COVID-19, we examined in the identified studies any consideration of non-health impacts, such as reduced productivity due to remote work, short-term job-related income loss, long-term unemployment, and other impacts on gross domestic product (GDP), and other sectors (e.g., related to environment or housing). **Results:** Of 274 articles screened, 61 met our inclusion criteria. The sample was comprised of 39 (64%) cost-effectiveness analyses (CEA), 17 (28%) cost-benefit analyses, and 5 (8%) other economic evaluations. The most commonly examined intervention was mobility restrictions, including stay-at-home orders and travel/gathering bans (n=25, 41%), followed by testing strategies (n=15, 25%) and therapeutics (n=15, 25%). Out of 22 CEAs that reported cost-per-quality-adjusted-life-years (QALY) outcomes, the median incremental cost-effectiveness ratio was lowest for therapeutics (\$848/QALY, n=7, inter-quartile range [IQR]: \$547-\$10,306) and highest for testing strategies (\$2,172,300/QALY, n=9, IQR: \$993,550-31,376,150). Twenty-nine studies (47%) included some type of non-health impact, most commonly lost income (n=17, 28%), followed by GDP impacts (n=11, 18%) and productivity (n=6, 10%). **Conclusions:** Consideration of non-health impacts is lacking in evaluations of COVID-19 interventions. Omission of these impacts can skew the value of pharmaceutical and non-pharmaceutical interventions and could have consequences for policy determinations as the pandemic continues. Researchers should consider including societal impacts in their analyses to more closely reflect the true value of interventions.



IN3 ECONOMIC VALUE AND HEALTH SYSTEM IMPACT OF REMDESIVIR IN TREATING HOSPITALIZED COVID-19 PATIENTS IN THE UNITED STATES

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Objectives: In the ACTT-1 study in hospitalized adults with laboratory confirmed COVID-19, remdesivir was found to be superior to placebo in shortening time to recovery from COVID-19. However, the economic value and health system impact of remdesivir treatment is still unclear. This study evaluated remdesivir's long-term cost-effectiveness and impact on health system capacities versus standard of care (SoC) for hospitalized COVID-19 patients in the United States (US). **Methods:** A hybrid decision-tree and Markov model simulated health and economic outcomes for hospitalized adult COVID-19 patients (average age of 58.9 years) from a US health system perspective over a lifetime horizon. Clinical inputs (e.g., hospitalization duration, mortality) were extracted from the ACTT-1 trial and real-world data. Cost inputs were sourced from an internal analysis or from the literature. Remdesivir acquisition cost was \$390/vial, and patients were assumed to receive 6.25 vials per treatment course. One-way and probabilistic sensitivity analyses were performed. A separate treatment capacity analysis was performed on a national scale, assuming a population of 328,200,000 and one monthly incident cohort of 201,000 patients eligible for treatment. **Results:** Relative to SoC, remdesivir was associated with a decrease in total costs (savings of \$8,844.49 per patient), increased life years (+0.62), and quality-adjusted life years (+0.47). Remdesivir was therefore dominant versus SoC (less costly and more effective). Results were robust in one-way and probabilistic sensitivity analyses. In the treatment capacity analysis, remdesivir increased the available hospital capacity by 1.4%, available ICU capacity by 32.1%, and total ventilator capacity by 2.3%. **Conclusions:** Remdesivir is a cost-effective option for the treatment of patients hospitalized with mild, moderate, and severe COVID-19 versus SoC. In addition, due to its demonstrated ability to shorten time to recovery, remdesivir is projected to increase



Machine Learning Applications in Health

ML1 COMPARING MORTALITY IN CARDIAC PATIENT SURGICAL CLUSTERS WITH MACHINE LEARNING CLUSTERS IN THE NATIONAL INPATIENT SAMPLE

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Objectives: This study investigates mortality in cardiac patient clusters based on surgery type versus patient clusters created through unsupervised machine learning (ML). **Methods:** The 2017 National Inpatient Sample describes US patient discharges and is provided by the Healthcare Cost and Utilization Project (HCUP). Patients included in this study were ≥ 18 years old with a "Major Therapeutic" primary cardiac procedure per HCUP Procedure Classes and Clinical Classification Software, and with a complete discharge record. Clusters were created through two different methods: 1) based on the three most common cardiac procedures; 2) based on patient and hospital characteristics, independent of mortality, through the ML algorithm K-prototypes. **Results:** A total of 170,326 discharges met inclusion criteria. The three prevalent cardiac procedures were percutaneous transluminal coronary angioplasty (PTCA) – 40.2%, coronary artery bypass graft (CABG) – 16.1%, and heart valve procedures (HV) – 15.0%. The prevalent procedures within each ML cluster were: Cluster 1: PTCA – 31.2% and CABG – 22.6%; 2: HV – 30.1% and CABG – 20.5%; 3: PTCA – 73.7% and CABG – 8.6%. The surgery clusters contained 121,423 discharges, while the ML clusters contained all 170,326 discharges. While the average Elixhauser Comorbidity Indices (ECI) based on the surgery clusters were different (PTCA: 2.1; CABG: 3.6; HV: 4.6; $p < 0.0001$), the ML clusters revealed a clear difference in the average ECI (Cluster 1: 9.8; 2: 2.9; 3: 0.8; $p < 0.0001$). While the mortality rate within each surgical group was different (PTCA: 1.6%; CABG: 1.7%; HV: 2.3%; $p < 0.0001$), the ML clustering exposed a stark distinction in mortality between clusters (Cluster 1: 7.6%; 2: 0.8%; 3: 0.7%; $p < 0.0001$).

