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Predicting death for nursing home residents before and after COVID-19 vaccination

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Introduction: COVID-19 vaccinations have reduced COVID-19 cases and mortality for nursing home (NH) residents. However, little is known about how the discriminability of COVID-19 death changed before and after vaccination. The objective of this study is to examine factors that predict COVID-19 death before and after vaccination.

Methods: We conducted a retrospective cohort study on NH resident data collected using the Resident Assessment Instrument Minimum Data Set Version 2.0. The cohort included 14,977 residents who tested positive for COVID-19 between March 7, 2020, and July 31, 2021. The cohort was split into two groups, COVID-19 deaths before and after January 1st, 2021. Logistic regression, LASSO regression, and random forests methods were used to evaluate the predictive ability of resident characteristics and COVID-19 mortality. Model performance was assessed using the area under the receiver operating characteristics curve (AUC). Variable importance was measured by the change in AUC.

Results: Age, sex, diabetes, declining cognition, and deteriorating activities of daily living were the most informative predictors for COVID-19 mortality before and after COVID-19 vaccination. COPD, emphysema, asthma, and emphysema were informative of COVID-19 mortality after vaccination only. The logistic regression, the LASSO regression, and the random forest model display similar predictive ability for COVID-19 mortality in their respective cohorts. A similar discrimination was reached for COVID-19 mortality before and after vaccination (AUC = 0.67, AUC=0.68, and AUC=0.644 respectively).

Conclusion: The factors associated with COVID-19 mortality are multifactorial and may be modifiable. Closer attention to these factors may help reduce COVID-19 mortality. Although the discriminability of the models was poor, advanced knowledge of NH resident characteristics can support upstream decision-making to prioritize care for NH residents who are at the greatest risk of COVID-19 death. Future studies are required to validate these findings and demonstrate the utility of this model in pandemic preventability.

Biography

Komal Aryal, MSc, is a Ph.D. student in the Health Research Methodology program at McMaster University. Her research focuses on employing statistical analysis and machine learning methods on big data to improve outcomes for the geriatric population.