Category :**ICU organization**

A278 - ***Modeling of covid-19 pandemic to estimate the demand of mechanical ventilators***

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Introduction:

The emergence of several variants is associated with COVID-19 rebound in many countries and regions with higher transmission advantage, and additional demand on medical resources including mechanical ventilators (MV). It can be challenging to estimate the demand by using infection rate of population, given the epidemiological response varies over time due to different factors such as pathogen variant, non-pharmaceutical interventions. Therefore, we modeled the outbreak with time-varying epidemiological response to estimate the demand of MV in a dynamic way.

Methods:

Confirmed cases and fatalities in six countries (US, Italy, UK, Russia, Saudi Arabia, Brazil), were collected from COVID-19 data repository by Johns Hopkins University. We performed a Long-short term memory (LSTM) model to predict confirmed cases and fatalities at 8th day by using data for past 7 days. Data from Jan22 to May14, 2020 were split into training (80%) and validation (20%) dataset. Internal testing dataset was from May16 to May24, 2020, while Taiwan data from May9 to Jun16, 2021 were used as external testing. The root mean squared logarithmic error (RMSLE) was used to evaluate the model performance. Then daily additional demand of MV for COVID-19 can be estimated by using below equation: Daily MV demand =(daily confirmed cases ×hospitalization rate ×ventilation rate)

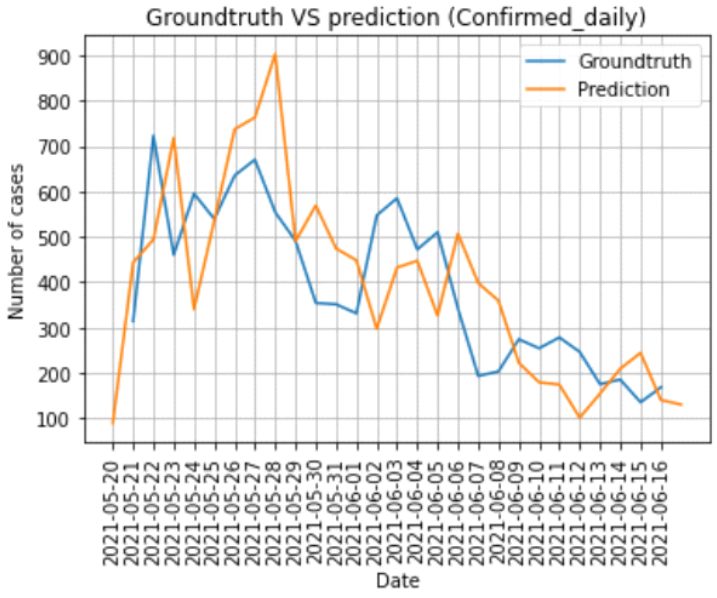
Results:

The average RMSLE for confirmed cases and fatalities of six modeling countries were 0.08 and 0.13 respectively. For Taiwan confirmed cases was much higher than modeling countries (0.26), whereas slightly increased in fatalities (0.18). The figure also showed that our model captured the systematic variation in number of new cases per day in Taiwan and estimate additional 181 MV were needed in peak day.

Conclusion:

Our results can be of help to indicate the time-varying trend of COVID-19 and assist management team to estimate dynamic demand of MV for different regions. The early warning to government can leave more time for public decision-making.

Image :



Time series of confirmed cases per day in Taiwan by both reporting and modeling