



Use of Artificial Intelligence in Weathering the COVID Storm

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Overview

- Great variation among countries in response
 - Increasingly clear that how countries respond affects clinical consequences
- Most COVID-19 forecasting models have used traditional epidemiological approaches
- Machine learning has been used for outbreak detection, timely diagnosis, to predict deaths, other complications
- There were major issues with data flow in this pandemic—in future should be able to do much more
 - Leverage AI in real time



How Canadian AI start-up BlueDot spotted Coronavirus before anyone else had a clue



By **Jerry Bowles** March 10, 2020

SUMMARY: An AI-based infectious disease surveillance system that searches the world around-the-clock for possible pandemics should have your attention.

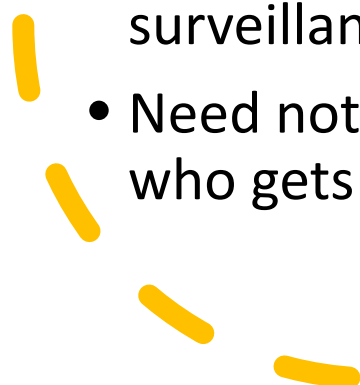
Detected COVID-19 days before the WHO

Much of BlueDot's predictive ability comes from data it collects outside official health care sources including, for example, the worldwide movements of more than four billion travelers on commercial flights every year; human, animal and insect population data; climate data from satellites; and local information from journalists and healthcare workers, pouring through 100,000 online articles each day spanning 65 languages.

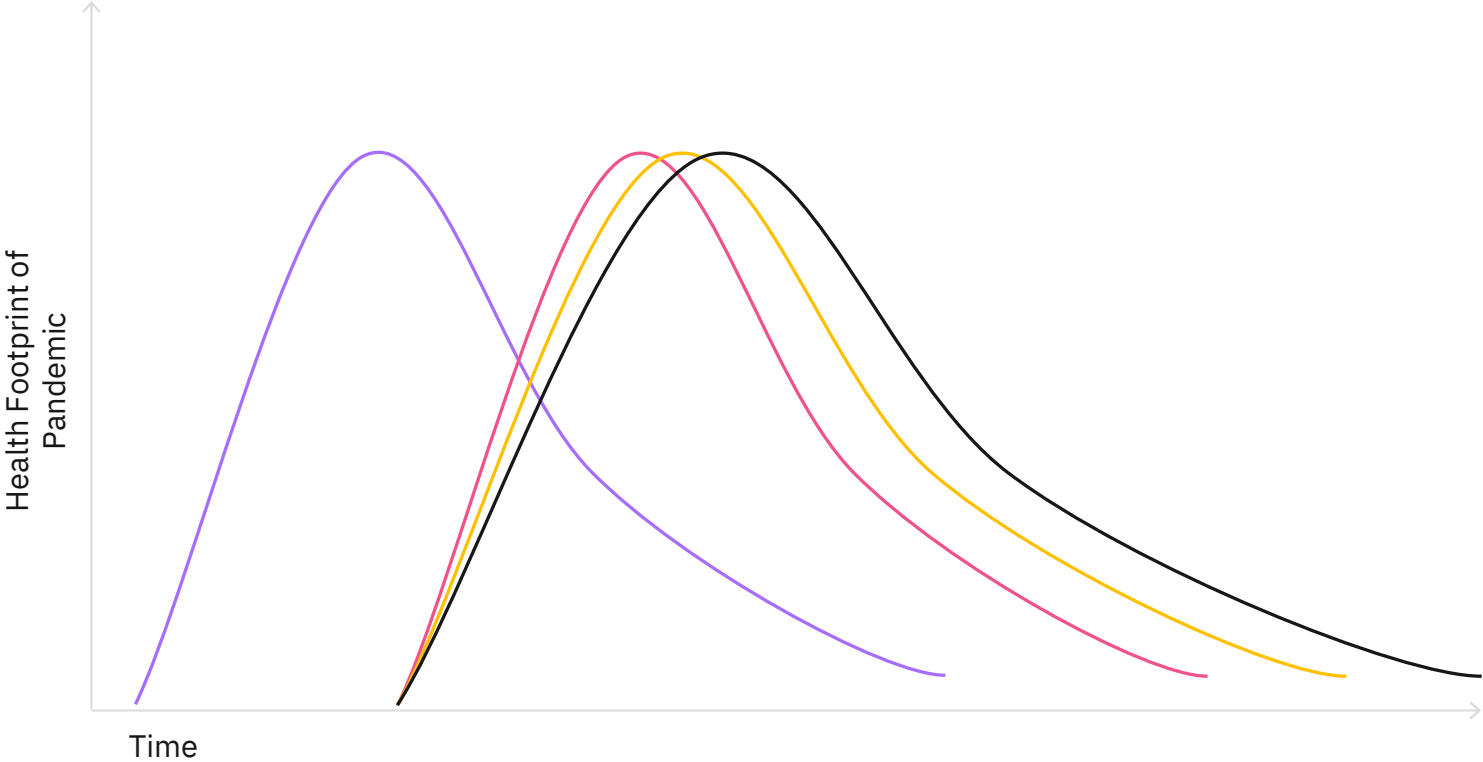


Controlling a Novel Infectious Agent with Unknown Behavior

- Need large quantities of data in near-real time
- Public health data suffers from old infrastructure, lags in data collection, privacy concerns
- In most developed countries, EHRs are not routinely used as data sources by public health agencies but could readily be used for better surveillance
- Need not just case counts and death rates, but rich information about who gets it, who is at greater risk, short and long-term consequences



The Four Curves of COVID-19*



Infectious disease:
COVID-19, influenza, lack of vaccinations

Chronic disease:
Heart disease, obesity, diabetes, cancer, asthma, arthritis, lack of primary care

Mental illness:
Depression, anxiety, social isolation

Inequities:
Unemployment, health disparities, social determinants of health

*A key to successful pandemic management is flattening these four curves

Constraints to Use of AI

- Data are generally incomplete which can lead to uncertain or biased estimates
 - For COVID-19, the CDC reported there were approximately ten SARS-CoV-2 infections for each reported case—only the worst cases counted early
- Major disparities exist in populations affected by COVID-19, yet inequalities may be underestimated due to lack of racial, ethnic and socioeconomic variables in datasets
- Sharing of data is difficult if agreements are not already in place



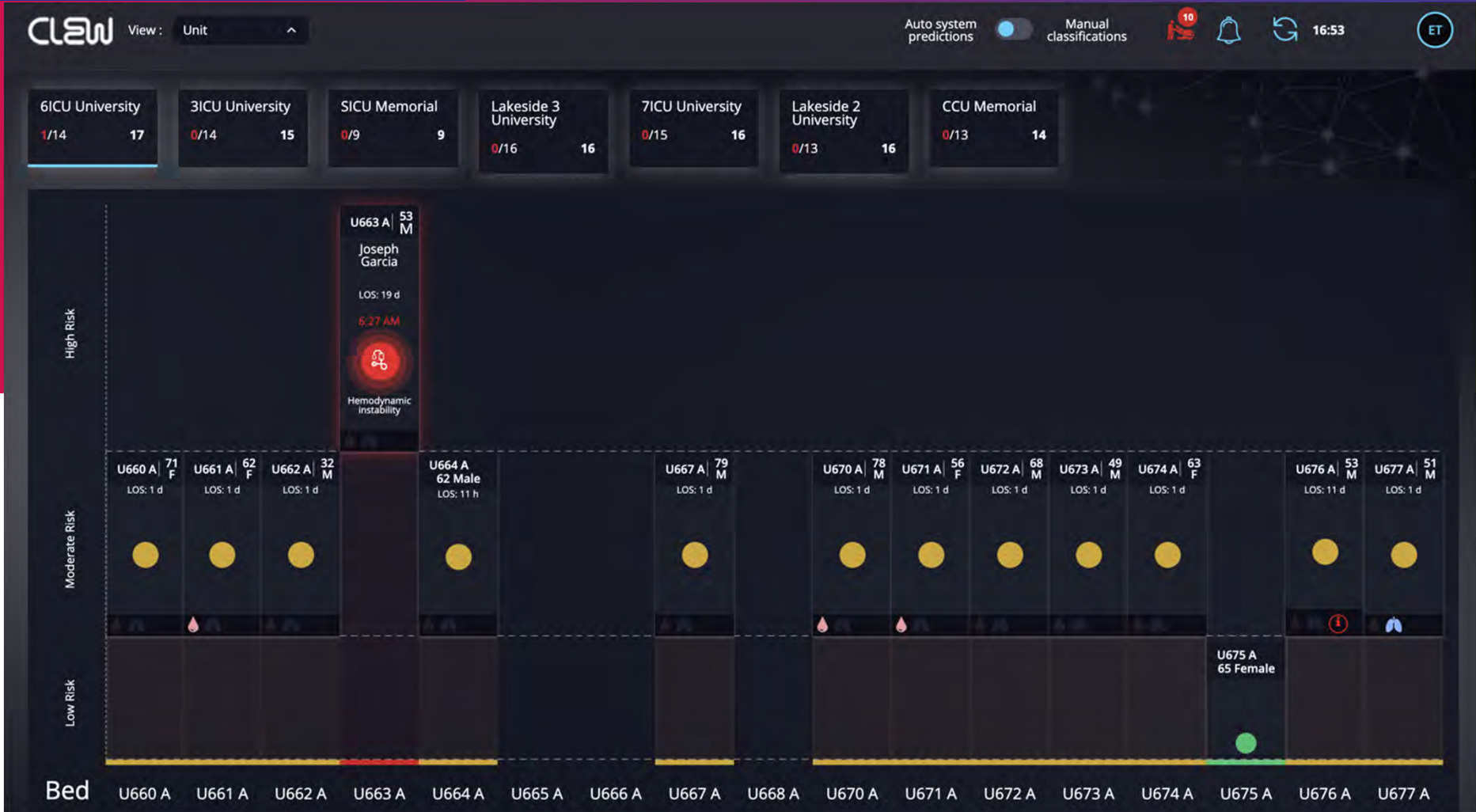
Sharing Data Effectively: Examples

- Essential to have better approaches for this going forward
- COVID-19 Decision Support Dashboard from the COVID-19 Healthcare Coalition—includes over 900 healthcare organizations
- Radiological Society of North America COVID-19 Data Imaging Repository
- IBM Functional Genomics Platform
- European Imaging COVID-19 AI Initiative supported by the European Society of Medical Imaging Informatics



Acuity & Occupancy

Workflow - At A Glance

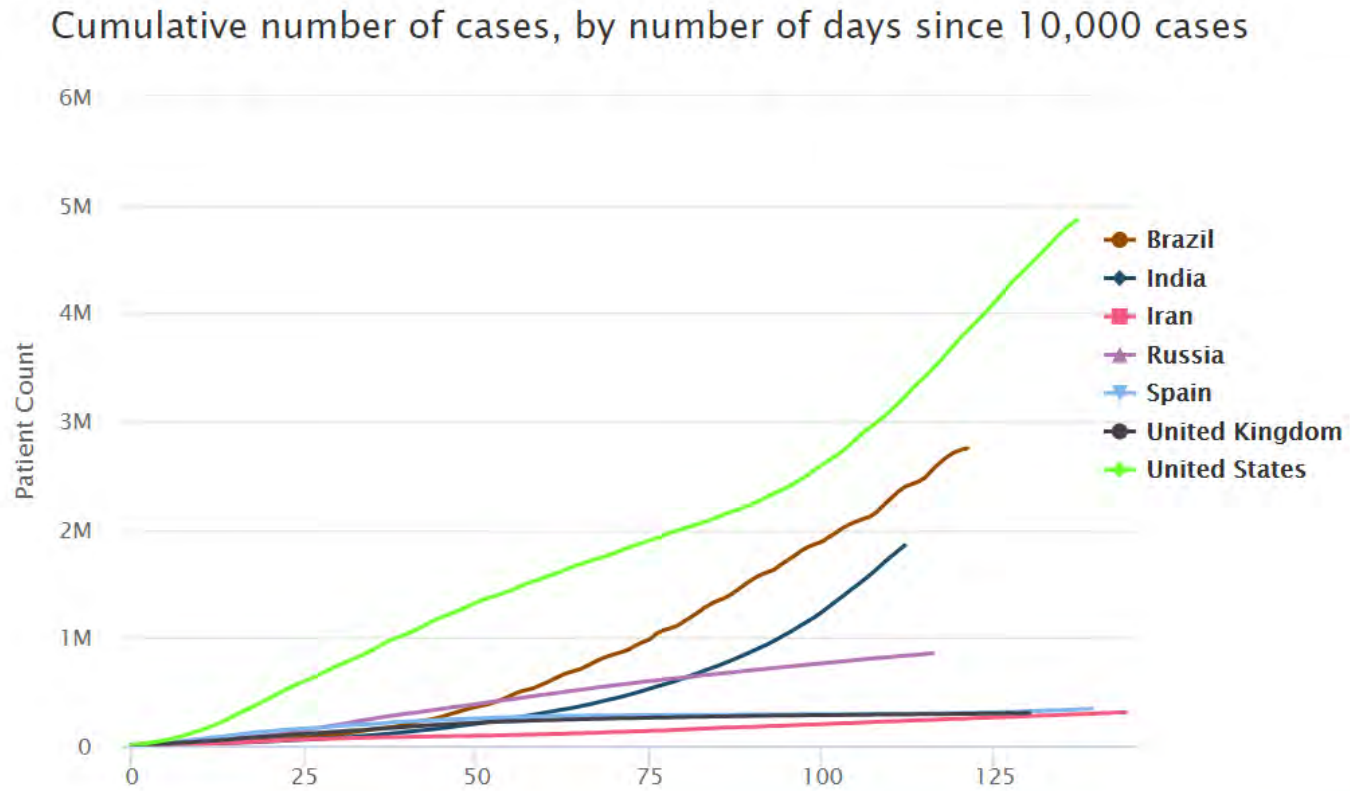



Sheba: Isolation Unit, Command Center



Cumulative number of cases (by number of days since 10,000 cases)

August 4, 2020



Source: **Worldometer** - www.worldometers.info 

Recommendations for Future Pandemics

- Essentially certain future pandemics will occur
- Three critical steps:
 - Prepare
 - Respond
 - Recover
- Countries need to prepare and maintain high-quality public health datasets which can be shared
- Need frameworks to share data between governments, health systems, industry and academics
- Need not just infectious disease data but wide array addressing health equity, mental health, chronic disease consequences
- Have to balance resource allocation between preparation, management and recovery

Conclusions

- Key to performing better in the pandemics of the future is to be able to predict what will happen
 - Also impact of specific actions (closing borders, sending ventilators to specific areas, wearing masks, sending children to school)
- Need four things to manage well:
 - Robust data
 - Public health infrastructure
 - Collaborative networks
 - Appropriate policies
- Artificial intelligence will be a key enabler of better management in the next pandemics