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The Benefits of a Mass Influenza Vaccination Campaign in the Time of COVID-19 (York Univ., 4/24)

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Abstract

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What is the message? The likelihood of COVID-19 becoming seasonal has crucial public health and societal implications. Importantly, a future COVID-19 outbreak that coincides with flu season could conspire to overwhelm and strain health-care facilities, especially in resource-limited settings, and increase infection transmission within these facilities. Given that the current vaccination coverage rate for influenza is still sub-optimal as well as the non-specific features of most respiratory infections, a mass influenza vaccination campaign implemented well before the onset of the flu season is important. An influenza vaccination campaign will contribute to the exposure of emerging/re-emerging respiratory pathogens and to their quicker identification. It will also facilitate the design and implementation of relevant public health interventions, by decreasing the total number of people with influenza-like illnesses (ILIs) presenting to the health-care system.

What is the evidence? A mathematical model focuses on the management of people with non-specific symptoms and complaining of ILIs, potentially at risk of developing the COVID-19 or other emerging respiratory infections during their investigation and work-up in the health-care setting. The model is used to examine the impact of mass influenza vaccination in managing the COVID-19 outbreak in a potential situation where a COVID-19 or other respiratory pathogen outbreak coincides with the flu season. The simulations and analyses show that by increasing the influenza vaccination coverage rate to a particular threshold before the onset of the flu season, the need for a high and stringent quarantine

and isolation rate to counteract the COVID-19 outbreak will be significantly reduced.

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COVID-19 and Influenza May Be Confused with Each Other

As global public health authorities exert their best efforts to contain the COVID-19 pandemic, researchers are trying to determine whether the disease will be eradicated, naturally attenuate and become endemic, or, like influenza, become seasonal. Determining the fate of SARS-CoV2 has crucial public health and societal implications. A future COVID-19 outbreak that coincides with flu season could conspire to overwhelm and strain health-care facilities, especially in resource-limited settings, and increase infection transmission within these facilities.

Clinical decision-making and public health responses are likely to be hampered as the distinction between the two infections can be challenging given the non-specific and often overlapping symptoms of influenza and COVID-19. Moreover, there still exists a high level of uncertainty around the clinical manifestation and progression of the infection and disease. This uncertainty is currently exacerbated by the lack of widespread rapid diagnostic tests that would provide quick and accurate diagnosis.

When a new outbreak occurs, the implementation of public health measures — including case detection and contact tracing, self-isolation, social distancing and quarantine — is challenged by the dearth of clinical and epidemiological data available in real-time. Delays of months or even years for effective treatments or vaccines to be discovered, tested, approved and, finally, made commercially available are likely. Furthermore, defining cases can be non-trivial, given the non-specific features of COVID-19, thus limiting downstream public health efforts to identify and

effectively manage the disease.

According to some experts, the virus responsible for the COVID-19 had already been circulating much earlier than late December 2019 but the exposure of such a pathogen was masked by a high number of people complaining of influenza-like-illness. Therefore, it is critically important to be able to identify and prevent influenza.

Two Benefits of a Mass Influenza Vaccination Campaign

The current vaccination coverage rate for influenza is still sub-optimal, about 42% among adults 18 years and older in Canada vs the national target of 80%. In turn, due to the non-specific features of most respiratory infections, we believe that a mass influenza vaccination campaign implemented well before the onset of the flu season will have two benefits. First, it will contribute to the exposure of emerging/re-emerging respiratory pathogens and to their quicker identification. Second, it will facilitate the design and implementation of relevant public health interventions, by decreasing the total number of people with ILIs presenting to the health-care system. This will help avoid straining health-care settings and so will decrease the likelihood of nosocomial transmission [i.e., infection that occurs in a hospital] of the COVID-19 or other emerging infectious agents in people under investigation for their disease.

Modelling the Benefits of Influenza Vaccination

We hypothesize that mass influenza vaccination prior to the onset of flu season could significantly reduce the number of ILIs in the general population, with fewer persons with ILIs requiring medical attention in high-risk settings. This would minimize the possibility of being late to identify circulating pathogens and so would reduce the likelihood of ongoing nosocomial transmission.

To test our hypothesis, we have devised a mathematical model focusing on the management of people with non-specific symptoms and complaining of ILIs, potentially at risk of developing the COVID-19 or other emerging respiratory infections during their investigation and work-up in the health-care setting[1]. This model framework was previously tested in a study to quantify impact of a preemptive mass influenza vaccination in controlling a SARS outbreak during a flu season. [2]

In our model, an important parameter is the total number of individuals with ILIs who subsequently seek medical advice in the outpatient or inpatient health-care setting. We examine a hypothetical situation where a COVID-19 or other respiratory pathogen outbreak coincides with the flu season. If there are still no reliable and rapid diagnostic tests, it will be extremely difficult to rapidly and accurately discriminate between the COVID-19 and other ILIs, given the non-specific clinical presentation of the COVID-19.

In a potential outbreak coinciding with the flu season, the combined total number of both flu and COVID-19 or other emerging respiratory pathogen patients seeking medical treatment in the same health-care settings will significantly increase. This, in turn, will lead to substantial increase of the probability of nosocomial transmission of the COVID-19. Therefore, we incorporate in our model a term describing a relationship between the vaccination coverage rate against influenza and the quarantine and isolation rate for the COVID-19. Doing so allows us to discuss qualitatively the impact of a mass influenza vaccination campaign on the containment of the COVID-19.

Our simulations and analyses indicate that the combination of an effective vaccination coverage rate against influenza and a moderate quarantine rate will be crucial in reducing the total number of people with ILIs. By increasing the influenza vaccination coverage rate to a particular threshold among the general population before the onset of the flu season, the need for a high and stringent quarantine and isolation rate to counteract the COVD-19 outbreak will be significantly reduced. This will save lives and spare valuable public health resources. Conversely, without reaching an effective influenza vaccination coverage rate, massive quarantine would be the only possible control strategy for the COVID-19 outbreak, even though it is practically unfeasible and unsustainable given its enormous costs and practical limitations.

Looking Forward – Flattening the Longer Curve

Based on the findings of our simulation, we call for an early launch of a mass influenza immunization campaign to significantly improve the vaccine uptake rate and better control a hypothetical COVID-19 outbreak coinciding with the flu season. We note that seniors are particularly vulnerable to both the flu and COVID-19, hence an enhanced influenza vaccine program should also include high-dose vaccines to protect seniors and their caregivers.

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References

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