IMPLICATIONS FOR INFLUENZA CONTROL MEASURES IN COMMUNITY AND HEALTHCARE SETTINGS

Lessons learned and Impact on Outbreaks

Waleed Javaid, MD, FACP, FIDSA, FSHEA

Professor of Medicine

Icahn School of Medicine at Mount Sinai
DISCLOSURES

Nothing to disclose
BACKGROUND

WHO select data

CDC select data
DISAPPEARING INFLUENZA
WHO DATA – ALL ZONE, COUNTRIES, AREA, TERRITORY COMPARISON OF NUMBER OF INFLUENZA DETECTIONS BY SUBTYPE

WHO SELECT DATA

selected countries
Canada, Denmark, Estonia, Finland, Iceland, Ireland, Latvia, Lithuania, Norway, Sweden, United Kingdom of Great Britain and Northern Ireland, United States of America, Bermuda, Saint Pierre and Miquelon, United Kingdom, Wales, United Kingdom, Northern Ireland, United Kingdom, Scotland, Faroe Islands, Greenland, United Kingdom, England

selected countries
Argentina, Australia, Chile, Cook Islands, Fij, Kiribati, Marshall Islands, Micronesia, Nauru, New Zealand, Niua, Palau, Papua New Guinea, Peru, Saint Lucia, Solomon Islands, Tonga, Tuvalu, Uruguay, Vanuatu, Falkland Islands, Guam, French Polynesia, New Caledonia, American Samoa, Tokelau, Northern Mariana Islands, Pitcairn Islands, Wallis and Futuna, Norfolk Island

International
National
Respiratory syncytial virus and influenza epidemics disappearance in Korea during the 2020–2021 season of COVID-19
Jong-Hun Kim, MD, Yun Ho Roh, Jong Gyun Ahn, Min Young Kim, RN, Kyungmin Huh, MD, Jaehun Jung, MD, Ji-Man Kang, MD
International Journal of Infectious Diseases
Volume 110 Pages 29-35 (September 2021)
DOI: 10.1016/j.ijid.2021.07.005

Heatmap of positive rates of
(A) Respiratory syncytial virus and
(B) Influenza virus in the national sentinel surveillance of 14 countries/regions

Positivity rates of influenza A and B in 2010–2020 for different age groups in Hamilton, Ontario

Bayesian inference for the mean positivity rate and its 95% credible interval of influenza A and B for the first 26 weeks in 2010–2019

Note: The red curve shows the positivity rate of influenza A and B for 2020, with the shaded grey bar indicating the start of COVID-19 lockdown.
DISAPPEARANCE OF SEASONAL RESPIRATORY VIRUSES IN CHILDREN UNDER TWO YEARS OLD DURING COVID-19 PANDEMIC: A MONOCENTRIC RETROSPECTIVE STUDY IN MILAN, ITALY

Cumulative respiratory viruses detections by year and viral species.
Plot of influenza patients from September 2019 to January 2020 in Okinawa, Japan. The horizontal bar represents the number of patients referred to one hospital per week per selected time points. Data from the 2015/16, 2016/17, 2017/18, 2018/19, and 2019/20 summer seasons are shown. In September 2019, a peak is observed. After the SARS-CoV-2 pandemic, the summer influenza in the Okinawa prefecture disappeared.

Seasonal variation in influenza and respiratory syncytial virus detection in pre-pandemic seasons and the 2020/2021 season
Temporal distribution of non-SARS-CoV-2 respiratory viruses by percentage test positivity in 2020/2021 season compared with pre-pandemic seasons. Data plotted by epidemiological surveillance week. For 2020/2021 season data plotted from week 35 (week ending 29th August 2020) to week 6 (week ending 13th February 2021) 2020).

The impact of the COVID-19 pandemic on influenza, respiratory syncytial virus, and other seasonal respiratory virus circulation in Canada: A population-based study

Helen E. Groves, Pierre-Philippe Piché-Renaud, Adriana Peci, Daniel S. Farrar, Steven Buckrell, Christina Bancej, Claire Sevenhuysen, Aaron Campigotto, Jonathan B. Gubbay, Shaun K. Morris

The Lancet Regional Health – Americas Volume 1 (September 2021) DOI: 10.1016/j.lana.2021.100015
The observed number of positive test results (blue dots), the fitted number of positive results to the seasonally adjusted model (solid blue line), and the fitted number of positive results for the counterfactual absence of a shelter-in-place order (orange line). Respiratory syncytial virus (RSV) and adenovirus data were not available for 2014 to 2016.
Numbers of Respiratory Virus Tests and Positive Tests for Different Viruses in 2019 and 2020
Blue bars indicate weekly numbers of multiplex tests performed, and colored lines indicate positive tests for different viruses per calendar week in 2019 and 2020.

Weekly rates with 95% confidence intervals of diagnosis of common pediatric infectious diseases in 2019 and 2020. Rates are expressed as diagnoses per 100,000 patients per day. The shaded area represents period of SD implementation in 2020.

A, AOM.
B, Bronchiolitis.
C, Common cold.
D, Croup.
E, Gastroenteritis.
F, Influenza.
G, Nonstreptococcal pharyngitis.
H, Pneumonia.
I, Sinusitis.
J, SSTI.
K, Streptococcal pharyngitis.
L, UTI.
ADJUSTED KAPLAN-MEIER SURVIVAL CURVE.

The figure shows the proportion of participants that are ILI-free by intervention arm over the 6-week study period adjusted for age, sex, race/ethnicity, handwashing practices, sleep quality, stress, alcohol consumption, and influenza vaccination.
FOREST PLOT OF ALL THE SUMMARY ODDS RATIOS FOR META-ANALYSED RISK FACTORS

Represents the overall odds ratios for meta-analysed risk factors on healthcare worker infection during all included viral respiratory pandemics. Comparator groups:

- Intubation vs no intubation
- AGMP vs no AGMP
- Frontline HCW vs non-frontline HCW
- Physician vs nurse
- Surgical mask vs no surgical mask
- N95 mask vs no N95 mask
- IPAC training vs no IPAC training
- Hand hygiene vs no hand hygiene
- Gowns vs no gowns
- Gloves vs no gloves
- Face protection vs no face protection.

META-ANALYSIS OF RCTS ASSESSING THE PROTECTIVE EFFECT OF MEDICAL MASKS AND N95 RESPIRATORS AGAINST CLINICAL AND LABORATORY-CONFIRMED RESPIRATORY OUTCOMES

(A) Clinical respiratory illness (CRI)
(B) Influenza-like illness (ILI)
(C) Laboratory-confirmed viral respiratory infection (VRI)
SUMMARY

We have seen a decrease in influenza, since 2020 COVID outbreak
Several International and national studies confirm the decrease
This likely is in part due to social distancing, mask wearing and symptom checks
Increased testing possibly played a part in early detection and isolation
There are studies showing impact of mask wearing in decrease in influenza rates in community and health care settings
Other factors remain unknown, unproven
OUR EXPERIENCE

The Outbreak Management
Real-Time Investigation of a Large Nosocomial Influenza A Outbreak Informed by Genomic Epidemiology

Waleed Javaid,1,2,3 Jordan Ehni,2,3 Ana S. Gonzalez-Reiche,3,4 Juan Manuel Carreño,3 Elena Hirsch,4 Jessica Tan,4,5 Zenab Khan,3 Divya Kriti,3 Thanh Ly,5 Bethany Kranitzky,5 Barbara Barnett,7,8 Freddy Cera,9 Lenny Prespa,9 Marie Moss,1 Randy A. Albrecht,4,10 Ala Mustafa,3 Ilka Herbison,1 Matthew M. Hernandez,4,3 Theodore R. Pak,3 Hala A. Alshhammary,9 Robert Sebra,3,11,12 Melissa L. Smith,3b Florian Krammer,4 Melissa R. Gitman,6 Emilia Mia Sordillo,6 Viviana Simon,14,16 and Harm van Bakel3,11

1Division of Infectious Diseases, Department of Medicine, Icahn School of Medicine at Mount Sinai, New York, New York, USA, 2Department of Infection Prevention, Mount Sinai Beth Israel, New York, New York, USA, 3Department of Genetics and Genomic Sciences, Icahn School of Medicine at Mount Sinai, New York, New York, USA, 4Department of Microbiology, Icahn School of Medicine at Mount Sinai, New York, New York, USA, 5The Graduate School of Biomedical Sciences, Icahn School of Medicine at Mount Sinai, New York, New York, USA, 6Clinical Microbiology Laboratory, Department of Pathology, Molecular, and Cell-Based Medicine, Icahn School of Medicine at Mount Sinai, New York, New York, USA, 7Department of Medicine, Icahn School of Medicine at Mount Sinai, New York, New York, USA, 8Department of Emergency Medicine, Icahn School of Medicine at Mount Sinai, New York, New York, USA, 9Clinical Laboratory, Mount Sinai Beth Israel, New York, New York, USA, 10The Global Health and Emerging Pathogens Institute, Icahn School of Medicine at Mount Sinai, New York, New York, USA, 11Icahn Institute for Data Science and Genomic Technology, Icahn School of Medicine at Mount Sinai, New York, New York, USA, and 12Black Family Stem Cell Institute, Icahn School of Medicine at Mount Sinai, New York, New York, USA

A. Timeline of the nosocomial IAV outbreak at a metropolitan hospital

B. Distribution of IAV subtypes detected in individuals identified in the outbreak investigation

C. The distribution of professions

D. The distribution of days between receiving seasonal influenza virus vaccination and testing positive for IAV among HCWs

E. Clinical signs and symptoms reported by HCWs who tested positive for IAV
Venn diagram illustrating the number of sequenced outbreak-confirmed H1N1 strains (N = 66) and outbreak-excluded IAV, including unrelated H1N1 strains (N = 113) and H3N2 strains (N = 36), identified in Hospital A (investigation and surveillance) and Hospital B (surveillance). Epidemiology describes the cases identified by infection prevention.

Pairwise comparison of the complete viral genomes. Note the tight cluster of the outbreak H1N1 strains (N = 66, red cluster) at the center and the 2 small H3N2 clusters at the top left of the pairwise comparison.

Dynamics of the case numbers and IAV strains during the investigation period. All color coding used in this panel are the same as those used in the panel B. The outbreak H1N1 strain (shown in red) was first detected on the day after the initiation of the investigation (day 1) in a hospitalized patient. The first 2 employees who tested positive for IAV on the day of the initiation of the investigation (day 0) harbored unrelated H1N1 strains.

Abbreviations: HCW, healthcare worker; IAV, influenza A virus; N/A, no viral genome available; p, patient.

Genomics of the nosocomial outbreak
<table>
<thead>
<tr>
<th>Symptom</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cough</td>
<td>27</td>
<td>18</td>
</tr>
<tr>
<td>Body Aches</td>
<td>21</td>
<td>14</td>
</tr>
<tr>
<td>Rhinorrhea</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>Headaches</td>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>Chills</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Other Symptoms</td>
<td>14</td>
<td>3</td>
</tr>
</tbody>
</table>

Fever?
Jan 24 2/14
First 2 Cases in Residents
Jan 26
Prophylaxis offered
Jan 27
Several Staff members develop symptoms
Jan 28
Fever excluded from Case def
Symptom Checks
Jan 29
Prophylaxis to all residents
Acknowledgements

Bakel lab
Jayeeta Dutta
Divya Kriti
Zenab Khan
Ana Gonzalez-Reiche
Jose Polanco
Mitchell Sullivan
Kieran Chacko
Deena Altman
Marilyn Chung
Adriana van de Guchte
Ajay Kumaresh
Elizabeth Webster
Brianne Ciferri
Harm van Bakel

Simon Lab
Matthew Hernandez
Elena Hirsch
Viviana Simon

Luksza Lab
Denis Ruchnewitz
Marta Luksza

Krammer Lab
Jessica Tan
Juan MC Quiroz
Florian Krammer

García-Sastre lab
Nacho Mena
Adolfo García-Sastre

Department of Pathology,
Clinical Microbiology Lab
Flora Samaroo
Melissa Gitman
Emilia Sordillo

Infection Prevention & Control
Mt. Sinai Downtown Network
Jordan Ehni
Marie Moss
Ilka Herbison

ISMMS core
James Powell
Bobby Sebra
One year before COVID 19 pandemic, we experienced one of the largest outbreaks of influenza in our hospital.

We were able to genetically link 41 (out 89) HCW and 13 (out 18) patients with the outbreak strain.

The outbreak was controlled within 72 hours of implementation of mandatory masking, symptom check, increased testing resulting in early detection and isolation.
LESSONS LEARNED
WHAT WE KNOW NOW

Initial concerns of ‘twindemic’ were not realized

CDC and WHO data shows a significant decrease in incidence of influenza since March 2020 in both hemispheres

Studies from across the world indicate decrease in influenza and other respiratory viral infections

Studies in the past have shown masking and other measures help decrease influenza and other respiratory viral infections.

Our experience has shown that symptom checks, masking, and increased testing were instrumental in controlling institutional outbreak
WHAT WE DO NOT KNOW

When will influenza season return?
Would the next influenza outbreak be clinical more severe?
Is masking better then vaccination alone?
What is the value of symptom checks?
IMPACT ON OUTBREAKS
FOR THE NEXT INFLUENZA OUTBREAK.....

- Frequent Symptom Checks
- Modification of case definition based on clinical presentation
- Testing who are at risk of acquiring infection
- Surgical Masking, universal
- Clear and frequent communication
- Genomic sequencing as needed