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Please scroll down this file to view a copy of the slides from the session.

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Spread Awareness, Stop Resistance: Antimicrobial Stewardship amid the COVID-19 Pandemic

Miranda So, BScPhm, PharmD, MPH (Epidemiology), *on behalf of the TARRN project team*
Valerie Leung, BScPhm MBA
Moderated by: Brad Langford, BScPhm PharmD BCPS BCIDP

November 23, 2021
Public Health Ontario Rounds

World Antimicrobial Awareness Week

- November 18th to 24th each year
- Global campaign to promote judicious use of antimicrobials to prevent antimicrobial resistance and keep antimicrobials working for future generations
- To make antimicrobial resistance more visible, "Go Blue" during WAAW
  - Wear light blue
  - Incorporate light blue into your social media profile
  - Explain why you have "gone blue" to family, friends, and colleagues
- For resources for providers and patients visit: **www.antimicrobialawareness.ca**

Objectives

1. Explain the potential impact of COVID-19 on antimicrobial use and antimicrobial resistance.
2. Explain rapid review findings on bacterial co-infection and secondary infection in patients with COVID-19.
3. Discuss how COVID-19 has impacted antibiotic stewardship programs globally.
4. Describe how COVID-19 has affected hospital antimicrobial stewardship programs in Ontario.

Which of the following factors could increase the rate of antimicrobial resistance during the COVID-19 pandemic?

a. Changes in hand hygiene

b. Vaccination against COVID-19

c. Antimicrobial Use

d. Shifts in healthcare utilization

What percentage of patients hospitalized with COVID-19 also have a bacterial co-infection?

a. 1%

b. 5%

c. 15%

d. 33%

The COVID-19 pandemic thus far…

December 2019

novel coronavirus SARS-CoV-2 reported in Wuhan China

COVID-19: respiratory disease caused by SARS-CoV-2

Jan 25, 2020

First case of COVID-19 reported in Canada in a traveler arriving in Toronto from Wuhan

March 11, 2020

WHO declared COVID-19 a global pandemic

March 17, 2020

Ontario declared state of emergency, in Wave 1 of the pandemic

Prevention & treatment

- **COVID vaccine(s)**
- **Corticosteroid**
- **Interleukin-6 inhibitors**
- **Monoclonal antibodies**
- **Remdesivir**
- **Public health measures**

November 2021

Ontario currently in Wave 4 of the pandemic

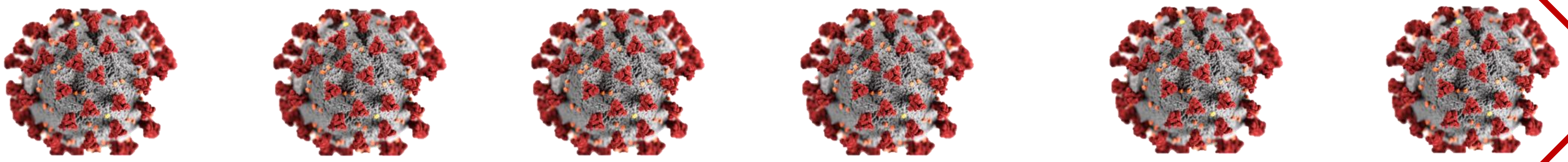

Image source: Center for Disease Control Public Health Image Library

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UNIVERSITY OF TORONTO LESLIE DAN FACULTY OF PHARMACY

What is the potential impact of COVID-19 pandemic on antimicrobial use and resistance?

JAC Antimicrob Resist
doi:10.1093/jacamr/dlaa049
JAC-Antimicrobial Resistance

PRO: The COVID-19 pandemic will result in increased antimicrobial resistance rates

Cornelius J. Clancy[1,2]*, Deanna J. Buehrle[2] and M. Hong Nguyen[1]

JAC Antimicrob Resist
doi:10.1093/jacamr/dlaa051
JAC-Antimicrobial Resistance

CON: COVID-19 will not result in increased antimicrobial resistance prevalence

Peter Collignon [1,2]* and John J. Beggs[3]

- Early data estimated prevalence of bacterial co-infections 10-35% <<< prevalence of antibiotic use of 70-100% among hospitalized patients
- Demographics of hospitalized patient
- Diagnostic challenges & empirical antibiotics

- Improved infection control practices
- Uptake in influenza vaccine
- Travel restrictions
- Physical distancing, social isolation
- Reduction in other respiratory infections reduce secondary bacterial infections and antibiotic exposure

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Clancy et al. JAC-AMR 2020. Collignon & Beggs. JAC-AMR 2020. van Duin et al. JAC-AMR 2020

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What is the potential impact of COVID-19 pandemic on antimicrobial use and resistance?

J Antimicrob Chemother 2020; **75**: 1681–1684
doi:10.1093/jac/dkaa194 Advance Access publication 20 May 2020
Journal of Antimicrobial Chemotherapy

COVID-19 and the potential long-term impact on antimicrobial resistance

Timothy M. Rawson[1–3], Luke S. P. Moore[1,3,4], Enrique Castro-Sanchez[1], Esmita Charani[1,5], Frances Davies[1,3], Giovanni Satta[1,3], Matthew J. Ellington[5] and Alison H. Holmes[1–3]*

EDITORIAL

Will coronavirus disease (COVID-19) have an impact on antimicrobial resistance?

Dominique L Monnet[1], Stephan Harbarth[2]
1. European Centre for Disease Prevention and Control (ECDC), Stockholm, Sweden
2. Infection Control Program and Division of Infectious Diseases, University of Geneva Hospitals and Faculty of Medicine, Geneva, Switzerland

J Antimicrob Chemother 2021; **3** Suppl 1: i5–i16
doi:10.1093/jacamr/dlab052
Antim... Resist...

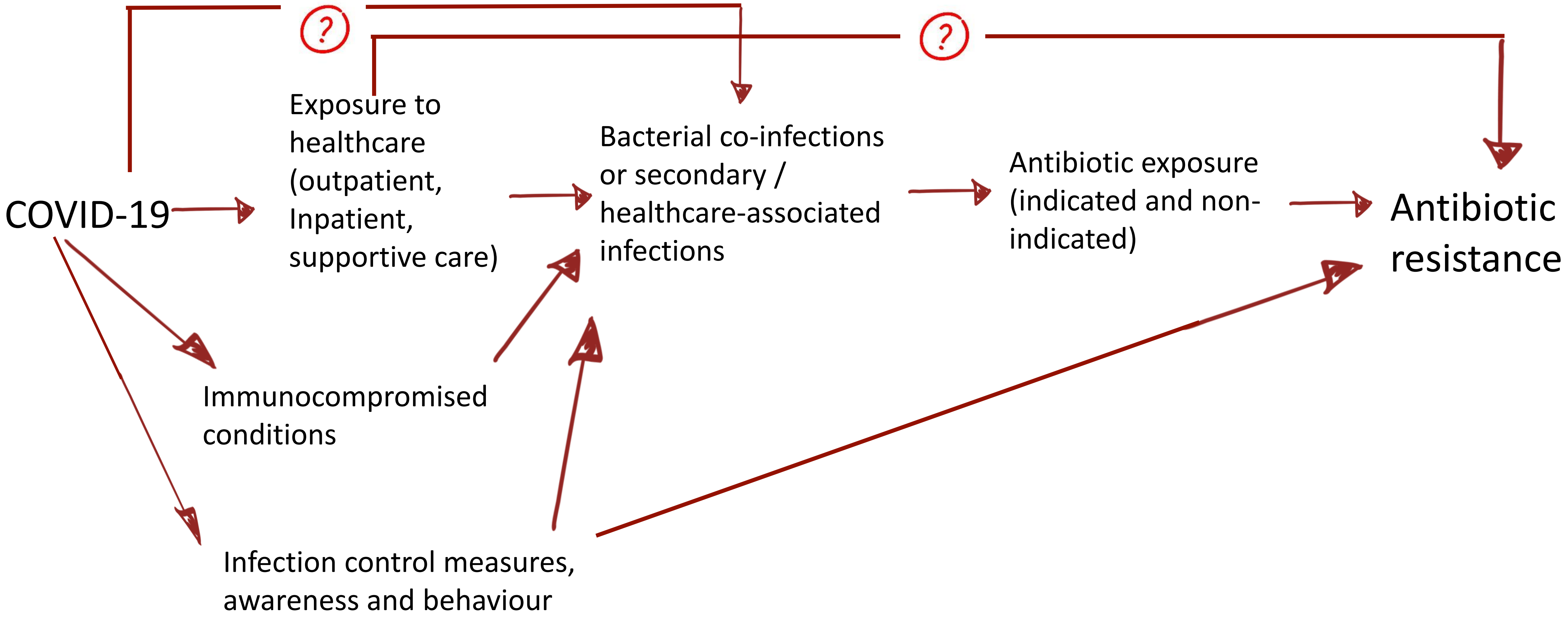
Antibiotic resistance during and beyond COVID-19

David M. Livermore[1]*
[1]*Norwich Medical School, University of East Anglia, Norwich, Norfolk NR4 7TJ, UK*

- Vaccine's effect on infection, transmission, hospitalization and risk of severe illness
- Public health measures
- Public's behaviour and access to healthcare
- Effect of COVID-19 therapy
- Infection prevention measures
- Collateral impact on non-COIVD healthcare services
- Human capital in healthcare
- Structural resources

Rawson et al. J Antimicrob Chemother 2020. Monnet and Harbarth. Eurosurveillance 2020. Livermore. JAC-AMR 2021.

Interplay between COVID-19, bacterial infections, antibiotic use and resistance



Khanna and Kraft. Future Microbiol 2021
Hazel et al. Infect Control Hosp Epidemiol 2021

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Understanding the associations between COVID-19, bacterial co-infections, antibiotic use and resistance

Toronto Antimicrobial Resistance Research Network (TARRN)

CMI CLINICAL MICROBIOLOGY AND INFECTION

SYSTEMATIC REVIEW | VOLUME 26, ISSUE 12, P1622-1629, DECEMBER 01, 2020

Bacterial co-infection and secondary infection in patients with COVID-19: a living rapid review and meta-analysis

Bradley J. Langford • Miranda So • Sumit Raybardhan • Valerie Leung • Duncan Westwood • Derek R. MacFadden • Jean-Paul R. Soucy • Nick Daneman • Show less

Published: July 22, 2020 • DOI: https://doi.org/10.1016/j.cmi.2020.07.016

CMI CLINICAL MICROBIOLOGY AND INFECTION

SYSTEMATIC REVIEW | VOLUME 27, ISSUE 4, P520-531, APRIL 01, 2021

Antibiotic prescribing in patients with COVID-19: rapid review and meta-analysis

Bradley J. Langford • Miranda So • Sumit Raybardhan • Valerie Leung • Jean-Paul R. Soucy • Duncan Westwood • Nick Daneman • Derek R. MacFadden • Show less

Published: January 04, 2021 • DOI: https://doi.org/10.1016/j.cmi.2020.12.018

Predictors and microbiology of respiratory and bloodstream co-infections in patients with COVID-19: living rapid review and meta-regression

BJ Langford, M So, V Leung, S Raybardhan, J Lo, T Kan, F Leung, D Westwood, N Daneman, DR MacFadden, J-P R Soucy.

Accepted manuscript

SHS + UHN ASP ANTIMICROBIAL STEWARDSHIP PROGRAM

Langford et al. Clin Microbiol Infect 2020. Langford et al. Clin Microbiol Infect 2021. Langford et al. Accepted manuscript.

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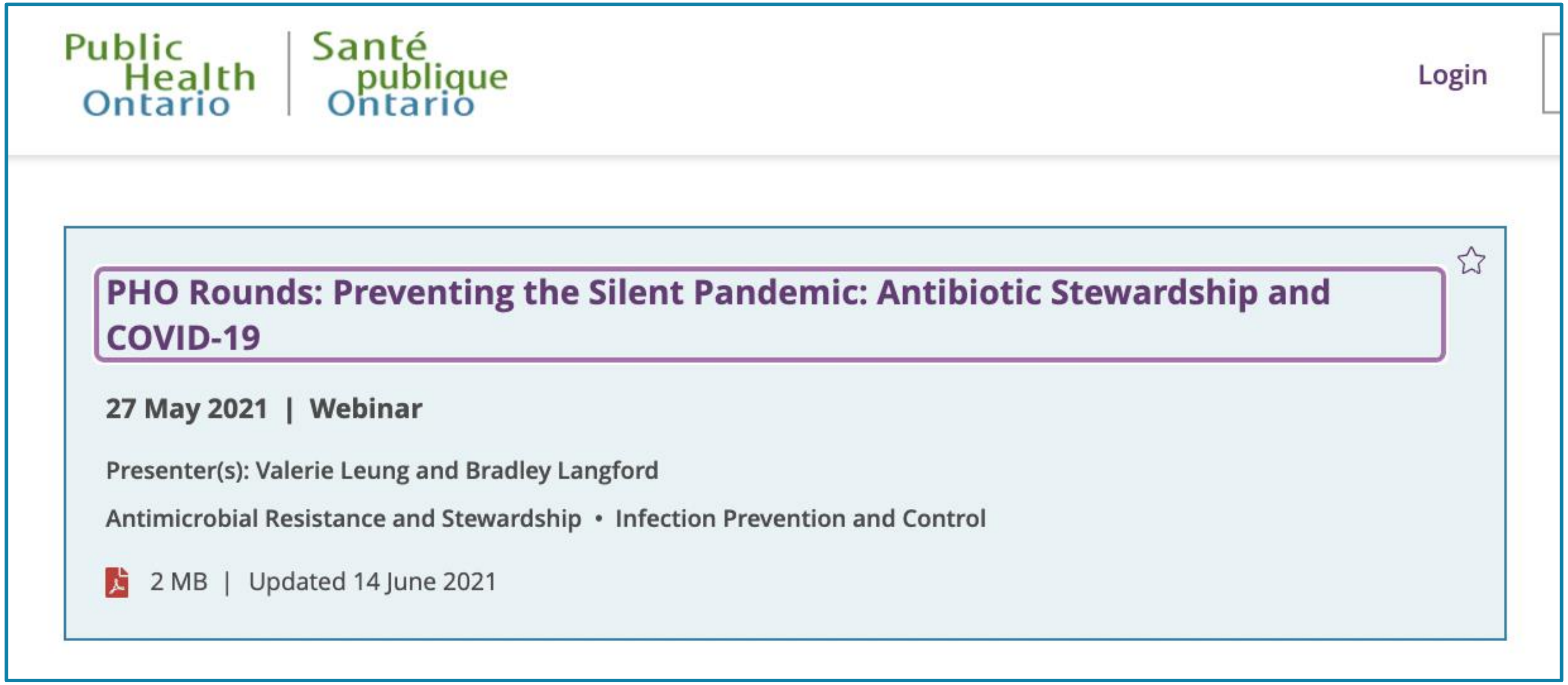
See previous PHO rounds recording (May 27, 2021)

To view an archived recording of this presentation please click the following link:
https://youtu.be/LJecAspSPNc



Living review hosted on TARRN website:
https://www.tarrn.org/covid

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Objectives of the three rapid reviews

I. Bacterial co-infection
- To determine prevalence of bacterial infections
- Identify most common co-infecting respiratory pathogens

II. Antibiotic use
- To determine prevalence of antibiotic use
- Identify predictors of antibiotic use

III. Respiratory / bloodstream infections + meta-regression
- To describe prevalence & microbiological characteristics of respiratory & bloodstream infections
- Identify predictors of bacterial infections at the study-population level

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Langford et al. Clin Microbiol Infect 2020. Langford et al. Clin Microbiol Infect 2021.
Langford et al. Accepted manuscript.

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Methods

Inclusion criteria:

Studies evaluating humans with lab-confirmed SARS-CoV-2

All healthcare settings and age groups

Any study design <u>except</u> case studies, case series < 10 patients, reviews

AND

I. Co-infection rapid review:

Study indicates number of patients with respiratory bacterial infection +/- bacteremia

II. Antibiotic use rapid review:

Study indicates number of patients prescribed antibiotic therapy

III.Respiratory/bloodstream infection & meta-regression:

Study indicates number of patients with respiratory bacterial infection +/- bacteremia

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Langford et al. Clin Microbiol Infect 2020. Langford et al. Clin Microbiol Infect 2021.
Langford et al. Accepted manuscript.

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Search strategy

- MEDLINE, OVID Epub and EMBASE databases for published literature
- Dates:
  I. Coinfection: January 1, 2019 to April 16, 2020
  II. Antibiotic use: January 1, 2019 to June 9, 2020
  III. Coinfection and meta-regression: January 1, 2019 to February 5, 2021
- Assistance from a medical information specialist
- Search terms:
  - COVID-19 terms as indexed
  - Epidemiology, descriptive cohort study terms
  - Co-infection/bacterial infection terms
  - Antibiotic prescribing terms
- All protocols registered with PROSPERO

Langford et al. Clin Microbiol Infect 2020. Langford et al. Clin Microbiol Infect 2021.
Langford et al. Accepted manuscript.

Primary analyses

I. Bacterial Infection Rapid Review

Estimate the overall proportion of confirmed acute bacterial infections in patients with COVID-19

Stratified by co-infection (on initial presentation) and secondary infection (during the course of the illness)

Stratified by severity

II. Antibiotic Infection Rapid Review

Estimate the overall prevalence of antibiotic prescribing among patients with COVID-19.

Stratified by region

Stratified by severity of COVID-19

Stratified by month of study completion

Stratified by age group

Langford et al. Clin Microbiol Infect 2020. Langford et al. Clin Microbiol Infect 2021.

Primary analyses

III. Respiratory/bloodstream infections and meta-regression

Estimate the overall proportion of confirmed acute bacterial infections in patients with COVID-19

Characterize the most common bacterial pathogens

Stratified by co-infection (on presentation) and secondary infection (during the course of the illness)

Stratified at level of study population by healthcare setting (ICU vs. ward vs. outpatient), ventilatory support, age, sex, month of publication, COVID-19 treatment per current standard of care

Statistical analyses

- Prevalence of patients with
  1. bacterial coinfection;
  2. secondary infections;
  3. antibiotic prescribed were estimated using random-effects meta-analysis
- Meta-regression to evaluate associations between patient characteristics at level of study population and risk of co-infection, and secondary infections
  - Univariable and multivariable models
  - Reported as prevalence odds ratios compared to referent group
- Heterogeneity estimated using I^2 statistic
- Risk of bias assessment (10-item tool) – low, moderate, or high
- Sensitivity analyses (risk of bias; bacteriological testing methods; clinical definition of infection)

Langford et al. Clin Microbiol Infect 2020. Langford et al. Clin Microbiol Infect 2021.
Langford et al. Accepted manuscript.

Results

Acute Bacterial Co-Infection in COVID-19

A Rapid Living Review and Meta-analysis

24 Studies included

3338 COVID-19 Patients

December 2019 to March 2020

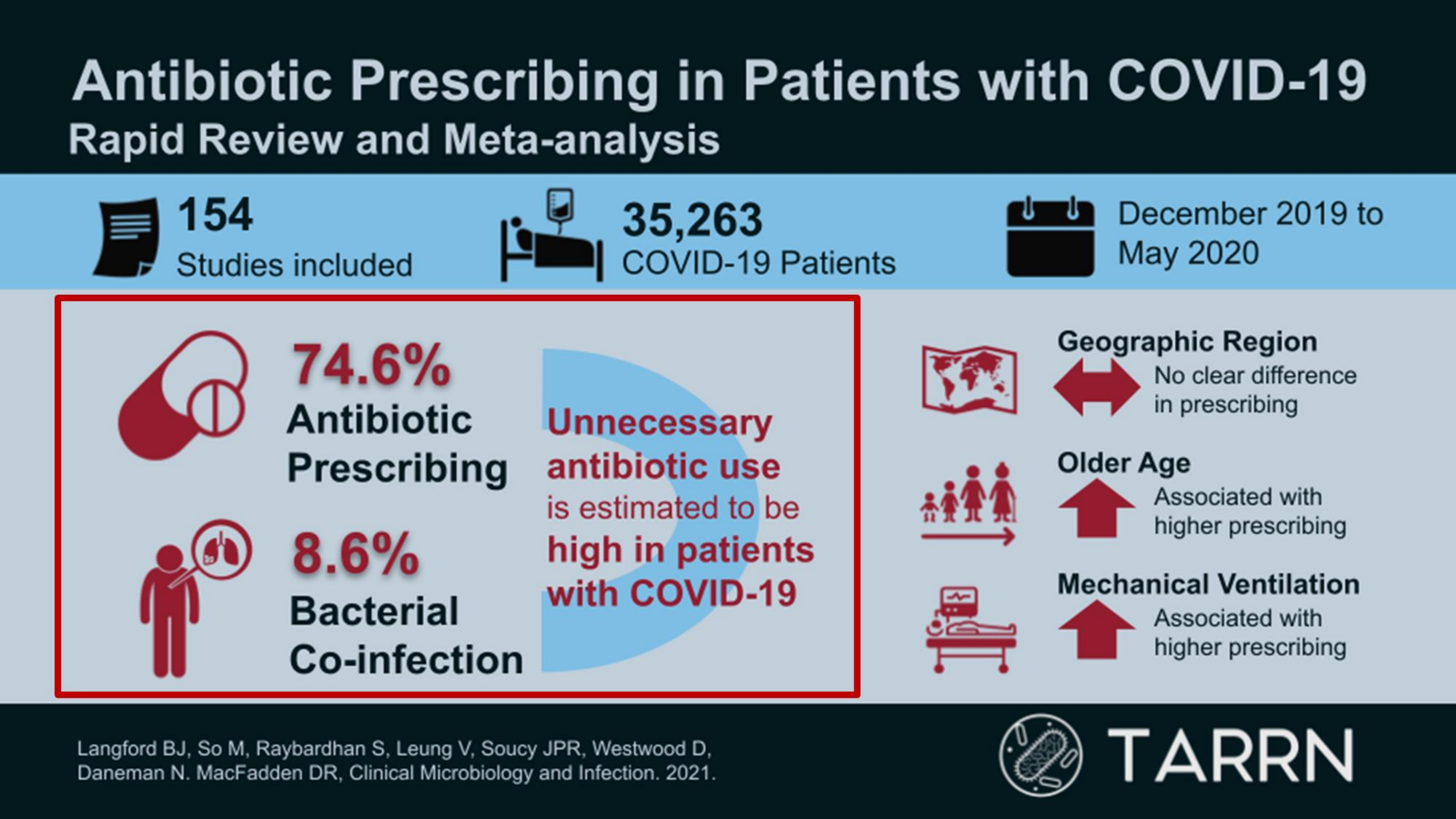
3.5%
Co-Infection
On presentation

14.3%
Secondary Infection
After presentation

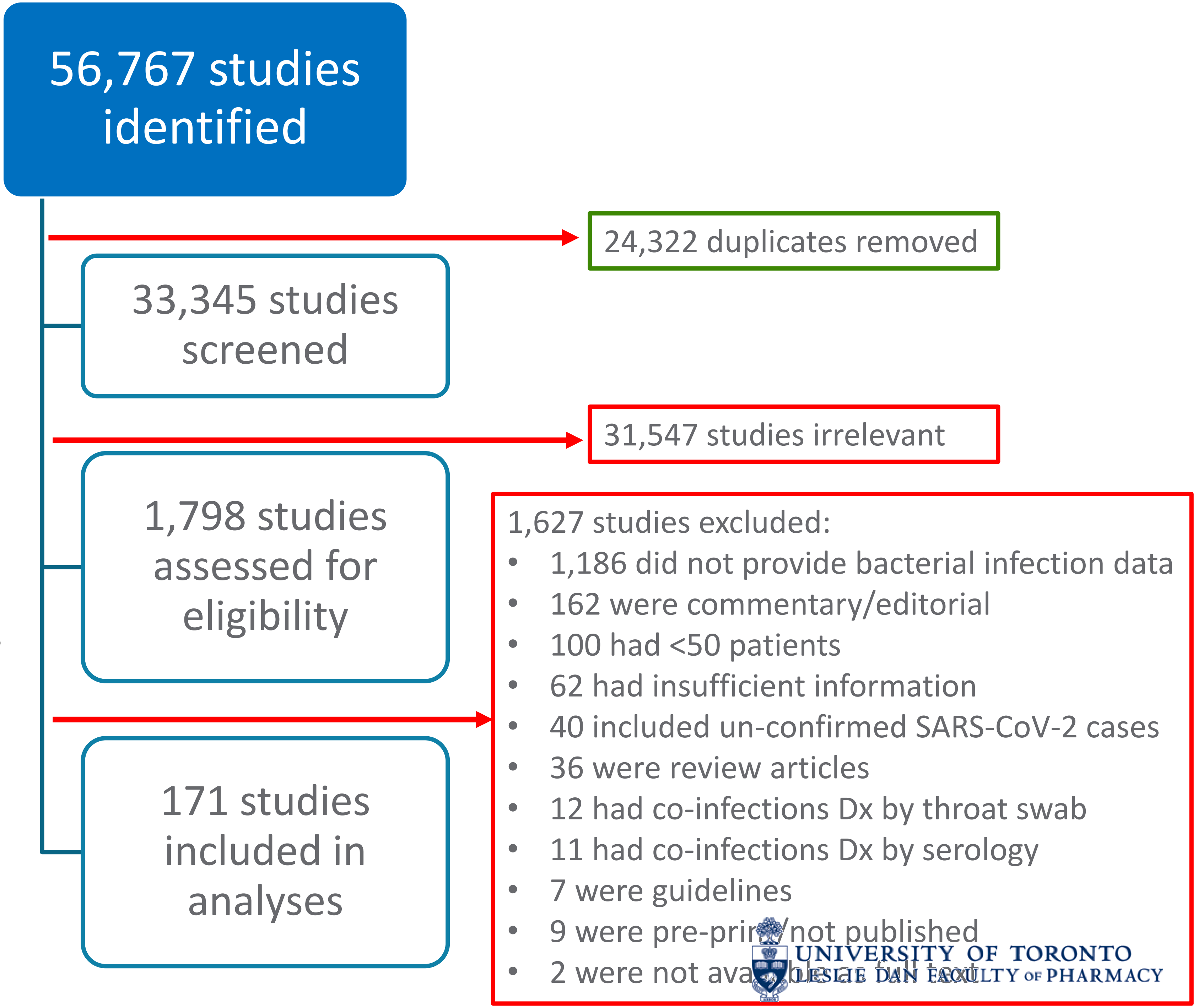
71.9% **Antibiotic Prescribing**

Langford BJ, So M, Raybardhan S, Leung V, Westwood D, MacFadden DR, Soucy JPR, Daneman N.
Clinical Microbiology and Infection. 2020.

TARRN
www.tarrn.org/covid


Antibiotic Prescribing in Patients with COVID-19
Rapid Review and Meta-analysis
154
Studies included
35,263
COVID-19 Patients
December 2019 to
May 2020
74.6%
Antibiotic
Prescribing
8.6%
Bacterial
Co-infection
Unnecessary
antibiotic use
is estimated to be
high in patients
with COVID-19
Geographic Region
No clear difference
in prescribing
Older Age
Associated with
higher prescribing
Mechanical Ventilation
Associated with
higher prescribing
Langford BJ, So M, Raybardhan S, Leung V, Soucy JPR, Westwood D,
Daneman N. MacFadden DR, Clinical Microbiology and Infection. 2021.
TARRN

Predictors and microbiology of respiratory and bloodstream co-infections in patients with COVID-19: living rapid review and meta-regression



SHS + UHN ASP Antimicrobial Stewardship Program

Langford et al.
Accepted manuscript

University of Toronto Leslie Dan Faculty of Pharmacy

Studies and patient population

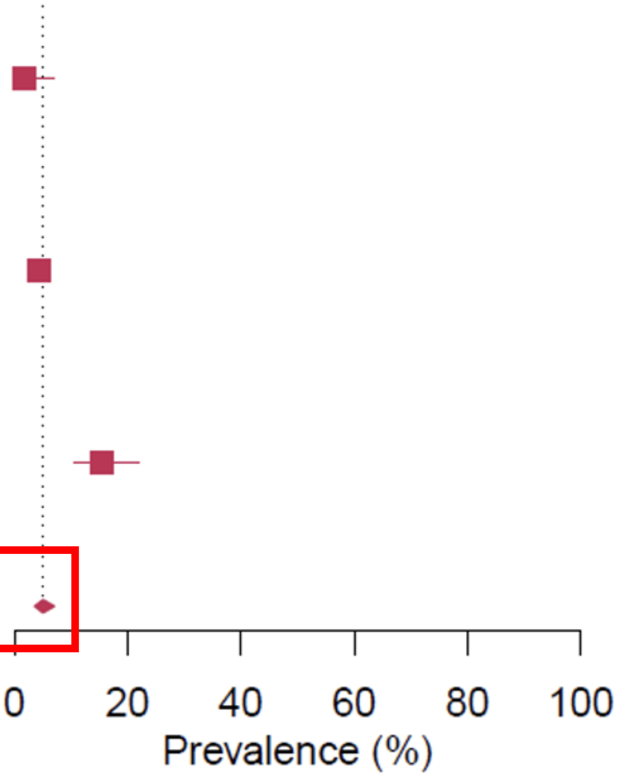
- Design: majority were retrospective, followed by prospective cohorts, randomized controlled trials
- Location: primarily Europe, Asia, North America
- Setting: general hospital admission, intensive care unit (ICU), mixed
- Patients: n = 171,262 from 171 studies
  - Median 41% (IQR 33-48%) female, median age 61 years old (IQR 53-64)
  - Median 25% were in ICU (IQR 13-100%)
  - Median 21% required mechanical ventilation (IQR 10-52%)
  - Most common comorbidities: chronic respiratory diseases, cardiovascular diseases and diabetes

Langford et al. Accepted manuscript

Prevalence of co-infection by healthcare setting

Co-infection

Subgroup	Total Patients	Prevalence (%)	95% C.I.
Hospital/Outpatient			
Random effects model	**1554**	**1.9**	**[0.5; 7.1]**
Heterogeneity: $I^2 = 74\%$, $\tau^2 = 2.9144$, $\chi^2_6 = 23.48$ ($p < 0.01$)			
Hospital			
Random effects model	**125212**	**4.4**	**[3.0; 6.4]**
Heterogeneity: $I^2 = 98\%$, $\tau^2 = 2.5771$, $\chi^2_{65} = 3963.37$ ($p = 0$)			
ICU			
Random effects model	**10559**	**15.4**	**[10.5; 22.0]**
Heterogeneity: $I^2 = 98\%$, $\tau^2 = 0.5858$, $\chi^2_{12} = 776.23$ ($p < 0.01$)			
Random effects model	**137325**	**5.1**	**[3.6; 7.1]**
Heterogeneity: $I^2 = 98\%$, $\tau^2 = 2.5385$, $\chi^2_{85} = 4884.93$ ($p = 0$)			
Test for subgroup differences: $\chi^2_2 = 24.91$, df = 2 ($p < 0.01$)			

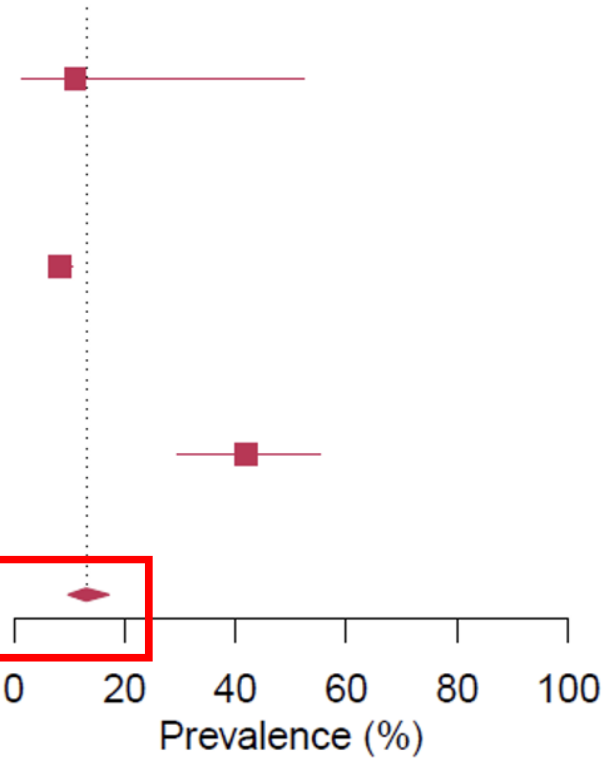


Langford et al. Accepted manuscript

Prevalence of secondary infections by healthcare setting

Secondary Infection

Subgroup	Total Patients	Prevalence (%)	95% C.I.
Hospital/Outpatient			
Random effects model	1661	11.1	[1.4; 52.3]
Heterogeneity: $I^2 = 99\%$, $\tau^2 = 2.3915$, $\chi^2_1 = 72.14$ ($p < 0.01$)			
Hospital			
Random effects model	30805	8.2	[6.3; 10.7]
Heterogeneity: $I^2 = 96\%$, $\tau^2 = 1.4088$, $\chi^2_{68} = 1688.9$ ($p < 0.01$)			
ICU			
Random effects model	8377	41.9	[29.5; 55.4]
Heterogeneity: $I^2 = 96\%$, $\tau^2 = 1.7737$, $\chi^2_{23} = 541.34$ ($p < 0.01$)			
Random effects model	40843	13.1	[9.8; 17.2]
Heterogeneity: $I^2 = 98\%$, $\tau^2 = 2.4490$, $\chi^2_{94} = 3896.62$ ($p = 0$)			
Test for subgroup differences: $\chi^2_2 = 44.09$, df = 2 ($p < 0.01$)			



Langford et al. Accepted manuscript

Organisms isolated

Co-Infection (n=1,319 organisms)

Acinetobacter (23)	CNST (217)
Chlamydia (5)	Enterococcus (65)
Enterobacter (42)	*S. aureus* (332)
Escherichia (99)	*S. pneumoniae* (40)
Haemophilus (38)	Other Streptococcus (69)
Klebsiella (113)	Other Gram positive (49)
Legionella (2)	Mycoplasma (25)
Proteus (7)	
Pseudomonas (90)	Other organisms (45)
Serratia (9)	
Stenotrophomonas (8)	
Other Gram negative (41)	

Secondary Infection (n=2,016 organisms)

Acinetobacter (123)	CNST (184)
Chlamydia (38)	Enterococcus (159)
Enterobacter (73)	*S. aureus* (315)
Escherichia (157)	*S. pneumoniae* (183)
Haemophilus (129)	Other Streptococcus (37)
Klebsiella (233)	Other Gram positive (29)
Legionella (1)	Mycoplasma (42)
Proteus (14)	
Pseudomonas (198)	Other organisms (2)
Serratia (23)	
Stenotrophomonas (41)	
Other Gram negative (35)	

21-25%
16-20%
11-15%
6-10%
1-5%
0%

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Meta-regression: factors associated with bacterial infections

- Studies with ICU patients had higher odds of bacterial infections (co-infections and secondary infections), compared with general admission/outpatient
  - Similarly, studies with higher proportion of patients requiring mechanical ventilation had higher odds of bacterial infections
- Studies with higher proportion of female patients had lower odds of secondary infections, compared with those with lower proportion of females
- Immunotherapy was not associated with a significantly higher odds of bacterial infections

Strengths and Limitations

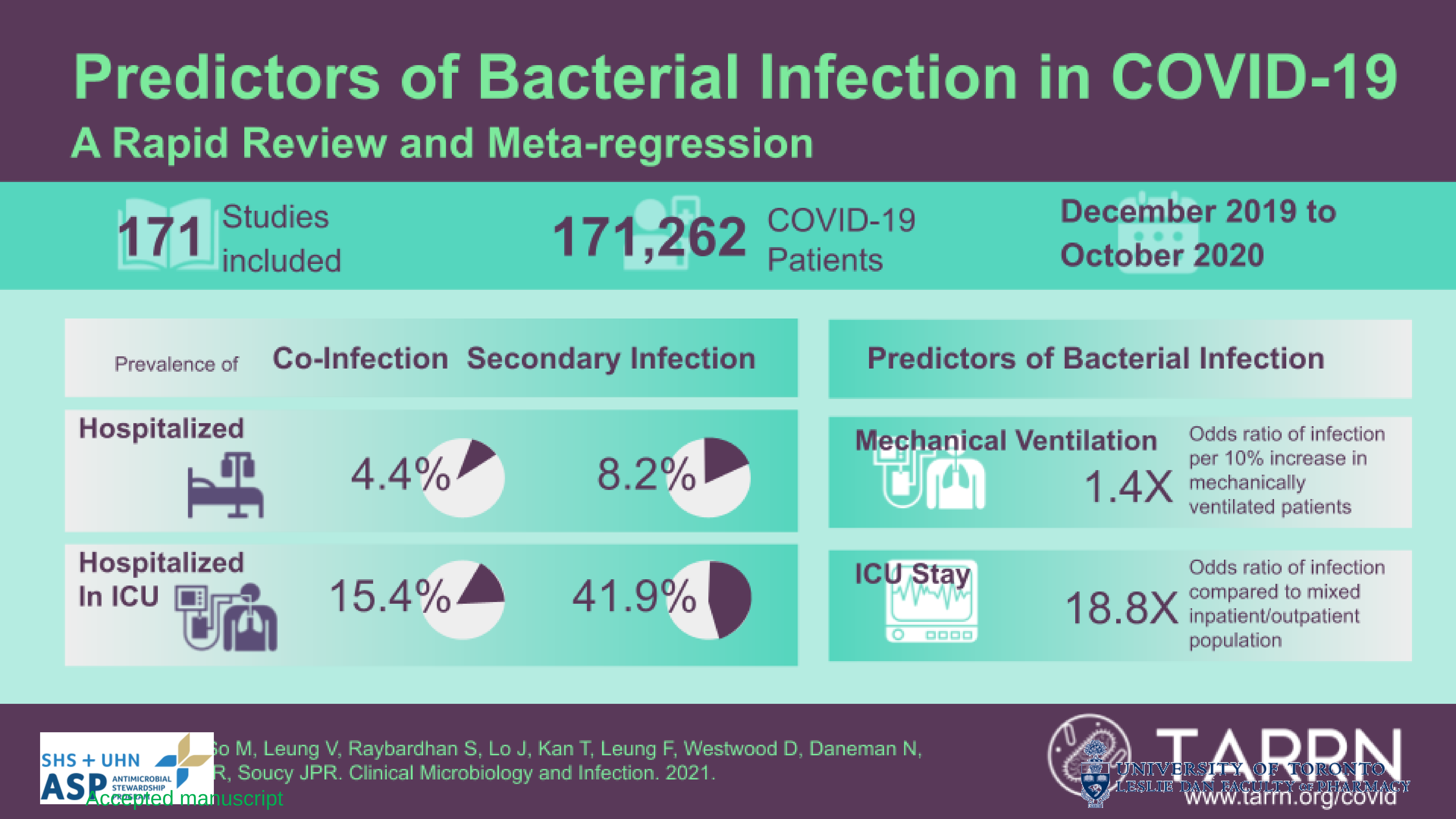
STRENGTHS

- Large number of studies and patients with consistent results from two previous rapid reviews
- Geographical representation
- Meta-regression quantifies risk of co-infection and secondary infections based on patient factors at study population level
- Identifies opportunities for antimicrobial stewardship and collaboration

LIMITATIONS

- Heterogeneity among studies
- Quality of studies and risk of bias
- Differences in bacterial detection methods limited to detail provided
- Challenges in differentiating between pathogens, contaminants, and colonizing organisms
- Distinction between primary and secondary infections as stated by investigators

Langford et al. Accepted manuscript.


Predictors of Bacterial Infection in COVID-19
A Rapid Review and Meta-regression
171 Studies included
171,262 COVID-19 Patients
December 2019 to October 2020
Prevalence of
Co-Infection
Secondary Infection
Hospitalized
4.4%
8.2%
Hospitalized In ICU
15.4%
41.9%
Predictors of Bacterial Infection
Mechanical Ventilation
1.4X
Odds ratio of infection per 10% increase in mechanically ventilated patients
ICU Stay
18.8X
Odds ratio of infection compared to mixed inpatient/outpatient population
So M, Leung V, Raybardhan S, Lo J, Kan T, Leung F, Westwood D, Daneman N,
R, Soucy JPR. Clinical Microbiology and Infection. 2021.
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www.tarrn.org/covid

TARRN COVID Bacterial Coinfections Project Team

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- Rawson TM, Moore LSP, Castro-Sanchez E, Charani E, Davies F, Satta G, et al. COVID-19 and the potential long-term impact on antimicrobial resistance. J Antimicrob Chemother. 2020;75(7):1681-4. Available from: https://doi.org/10.1093/jac/dkaa194

Antibiotic Stewardship during COVID-19

What is antimicrobial stewardship?

"coordinated interventions designed to improve and measure the appropriate use of antimicrobial agents by promoting the **selection of the optimal antimicrobial** drug regimen including **dosing**, **duration** of therapy, and **route** of administration"

-IDSA/SHEA 2012

Fishman N. Policy statement on antimicrobial stewardship by the Society for Healthcare Epidemiology of America (SHEA), the Infectious Diseases Society of America (IDSA), and the Pediatric Infectious Diseases Society (PIDS). Infect Control Hosp Epidemiol. 2012;33(4):322-7. Available from: https://doi.org/10.1086/665010

Opportunities for ASP Involvement in Pandemic Response

- Early in the pandemic, several areas were highlighted as opportunities for ASPs to support COVID-19 response by Stevens et al:
  - Collaboration w/IPAC
  - Diagnostic Stewardship
  - Treatment (e.g. support guideline development)
- Very limited literature on the topic; informal Twitter poll by Stevens et al. revealed roughly a third of ASPs had direct involvement, a third had indirect involvement and a third had no involvement in COVID-19 response/planning.

Stevens MP, Patel PK, Nori P. Involving antimicrobial stewardship programs in COVID-19 response efforts: all hands on deck. Infect Control Hosp Epidemiol. 2020;41(6):744-5. Available from: https://doi.org/10.1017/ice.2020.69

ASP Core Activities – Adaptation

Mazdeyasna et al also suggested that ASP Core activities/strategies could be adapted to support COVID-19 response:

- **Prospective Audit & Feedback**
- Formulary Restriction & Preauthorization
- Streamlining/de-escalating therapy and antibiotic “time outs”
- Education
- Intravenous to oral stepdown (IV to PO)
- Engagement with microbiology/Infection Prevention and Control (IPAC)
- **Guidelines and Clinical Pathways**

Mazdeyasna H, Nori P, Patel P, Doll M, Godbout E, Lee K, et al. Antimicrobial stewardship at the core of COVID-19 response efforts: implications for sustaining and building programs. Curr Infect Dis Rep. 2020;22(9):23. Available from: https://doi.org/10.1007/s11908-020-00734-x

Prospective Audit and Feedback – Examples of Adaptation

COVID-19 Focused

- Identify patients that would benefit most from diagnostic testing in resource-limited setting.
- Review appropriate use of investigational use agents (e.g. hydroxychloroquine, remdesivir, monoclonal antibodies).
- Monitor toxicity associated with investigational agents.

Antimicrobial Use

- Review concomitant antimicrobial use in patients with COVID-19.
- Review antimicrobial administration times for consolidation.

Pierce J, Stevens MP. COVID-19 and antimicrobial stewardship: lessons learned, best practices, and future implications. Int J Infect Dis. 2021;113:103-8. Available from: https://doi.org/10.1016/j.ijid.2021.10.001

What is known so far about the impact of COVID-19 involvement on ASPs?

Has ASP involvement in the pandemic adversely impacted traditional ASP activities? Or has ASP involvement created opportunities to strengthen program infrastructure/increase prominence beyond the pandemic?

- Survey of Irish ASP practitioners found majority reported a significant decrease in ASP program effectiveness as a result of the pandemic. (Martin et al, 2021)
  - Respondents were asked about "effectiveness" of program before vs. during COVID-19 on a scale of 1:10.
  - Challenges: lack of resources due to re-allocation to COVID-19 response, impact of IPAC restrictions on performing key activities such as rounds, audits, education, committee meetings.
- In Singapore, Liew et al. reported maintenance of ASP acceptance rates during the pandemic, and a decrease in broad spectrum antimicrobial usage and length of stay in cases where ASP interventions were accepted. (Liew et al., 2020)
- **What about in Ontario?**

Martin E, Philbin M, Hughes G, Bergin C, Talento AF. Antimicrobial stewardship challenges and innovative initiatives in the acute hospital setting during the COVID-19 pandemic. J Antimicrob Chemother. 2021;76(1):272–5. Available from: https://doi.org/10.1093/jac/dkaa400
Liew Y, Lee WHL, Tan L, Kwa ALH, Thien SY, Cherng BPZ, et al. Antimicrobial stewardship programme: a vital resource for hospitals during the global outbreak of coronavirus disease 2019 (COVID-19). Int J Antimicrob Agents. 2020;56(5):106145. Available from: https://doi.org/10.1016/j.ijantimicag.2020.106145

Ontario ASP Landscape Survey - Overview

- In 2016, PHO initiated a voluntary online survey to understand the overall landscape of antimicrobial stewardship in Ontario hospitals with a focus on program structure and strategy implementation.
- In 2018, PHO conducted a follow-up survey to understand how hospital ASPs had evolved and to learn more about antimicrobial use (AMU) and antimicrobial resistance (AMR) measurement in hospitals.
- 2021 survey continues to track changes in program structure, AMU and AMR but also gathers insight on the role of hospital ASP in the COVID-19 pandemic response and impact of pandemic on traditional ASP activities.

2021 Ontario ASP Landscape Survey

Part A: Antimicrobial Stewardship Program (ASP)

- Program Structure (e.g. funding and resources)

Part B: AMR (Antimicrobial Resistance)

- Hospital-wide Antibiogram (2018 or more recent)

Part C: Antimicrobial Use (AMU)

- Hospital-wide DDD or DOT for 2018, 2019, 2020 adjusted for patient volume (per 1000 patient days)

Part D: COVID-19 Impact on ASP activities

- Changes in funding, involvement of ASP in pandemic response, impact on ASP activities between March 2020-present

Methodology – Survey Dissemination

- Voluntary online survey (Surveys@PHO) opened on September 21 2021 and extended until November 30 2021
- Distributed to hospital corporations with instructions that it should be completed by the individual that is most responsible for antimicrobial stewardship in their organization .
- Intent was to obtain 1 response per corporation unless organization wished to submit separate site-specific responses.
- Targeted distribution list was created based on PHO contacts + Antimicrobial Stewardship Hospital Pharmacists of Ontario Network (ASHPON) + hospital list from Ontario Ministry of Health and Long-term Care (MOHLTC).
- Targeted email invitation + email/telephone reminders to encourage response. Nominal incentive offered for participation ($10 Tim's gift card).

Methodology – Preliminary Survey Analysis

- Survey responses from September 21 to November 2 were included in preliminary analysis.
- Incomplete responses included in analysis; reconciliation of unintended duplicate responses was performed.
- Sites that are primarily Mental Health, Ambulatory or Independent are excluded from denominators.
- Descriptive analysis of Part A/D responses performed at an aggregate level (overall) and by hospital type (Acute Teaching, Large Community, Small Community, Complex Continuing Care & Rehabilitation).
  - Hospital type is based on Ontario Hospital Association classification.[1] If a corporation has multiple sites, classification is usually by largest hospital type.

Canadian Institute of Health Information. Hospital report 2007: acute care. Ottawa, ON: Canadian Institute of Health Information; 2007. Available from: https://secure.cihi.ca/free_products/OHA_Acute07_EN_final_secure.pdf

Results - Response Rate

2016	2018	2021
Response Rate = 75% (95/129)	**Response Rate = 55%** (70/127)	**Response Rate = 62%** (79/128)
N = 129	N = 127	N = 128

- Changes denominator (N) over time are the result of changes in corporate structure (e.g. mergers, alliances).
- Response rate for 2021 is preliminary and is expected to be > 70% for final analysis.

Ontario ASP Landscape Survey – Response Rate

	2016	2018	2021
Overall	**75%** (95/129)	**55 %** (70/127)	**62%** (79/128)
Acute Teaching	93% (14/15)	67% (10/15)	64% (9/14)
Large Community	77% (44/57)	67% (36/54)	74% (40/54)
Small Community	60% (26/43)	35% (16/45)	44% (20/45)
CCC & Rehab	79% (11/14)	62% (8/13)	67% (10/15)

ASP Structure: Formalization of ASP

	2016	2018	2021
Yes/ In Progress	93% (88/95)	97% (68/70)	96% (76/79)
No	7% (7/95)	3% (2/70)	4% (3/79)

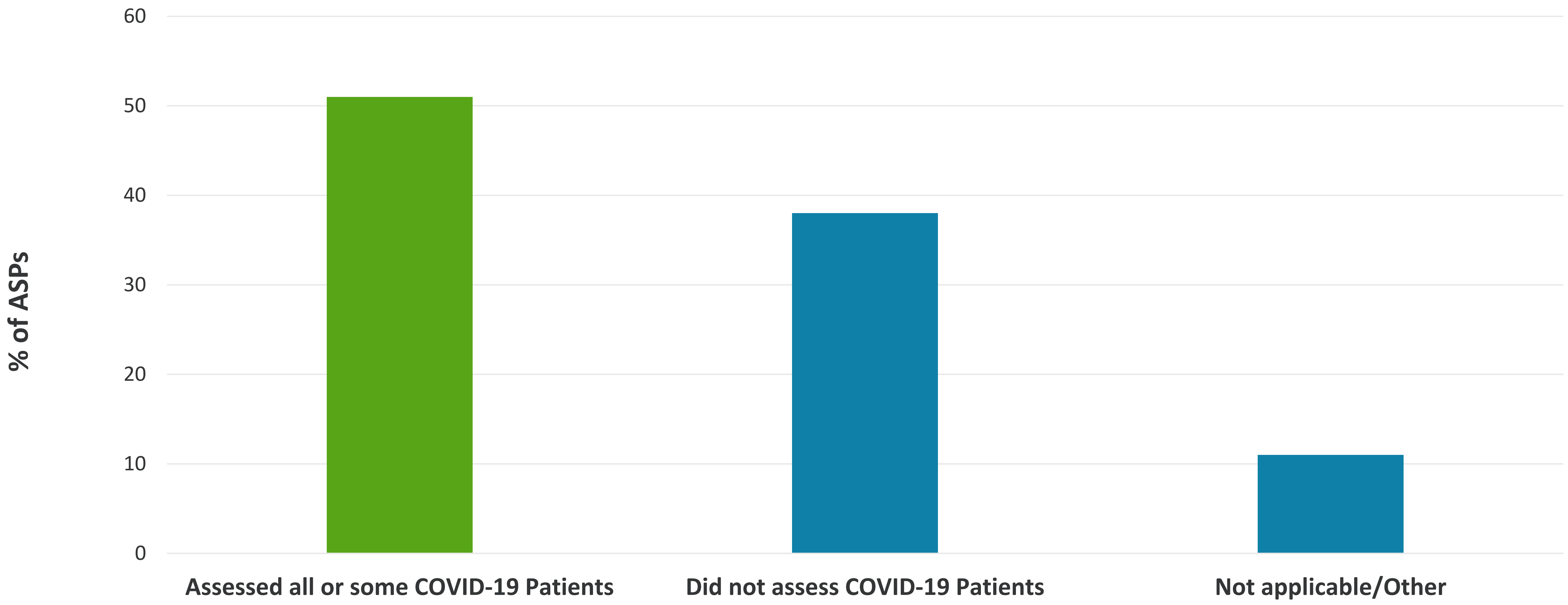
Formalized ASPs with Designated funding/resources

	2016	2018	2021
Overall	**50% (44/88)**	**59% (40/68)**	**57% (43/76)**
Acute Teaching	85% (11/13)	90% (9/10)	89% (8/9)
Large Community	68% (28/41)	69% (25/36)	70% (28/40)
Small Community	13% (3/24)	19% (3/16)	10% (2/20)
CCC & Rehab	20% (2/10)	38% (3/8)	50% (5/10)

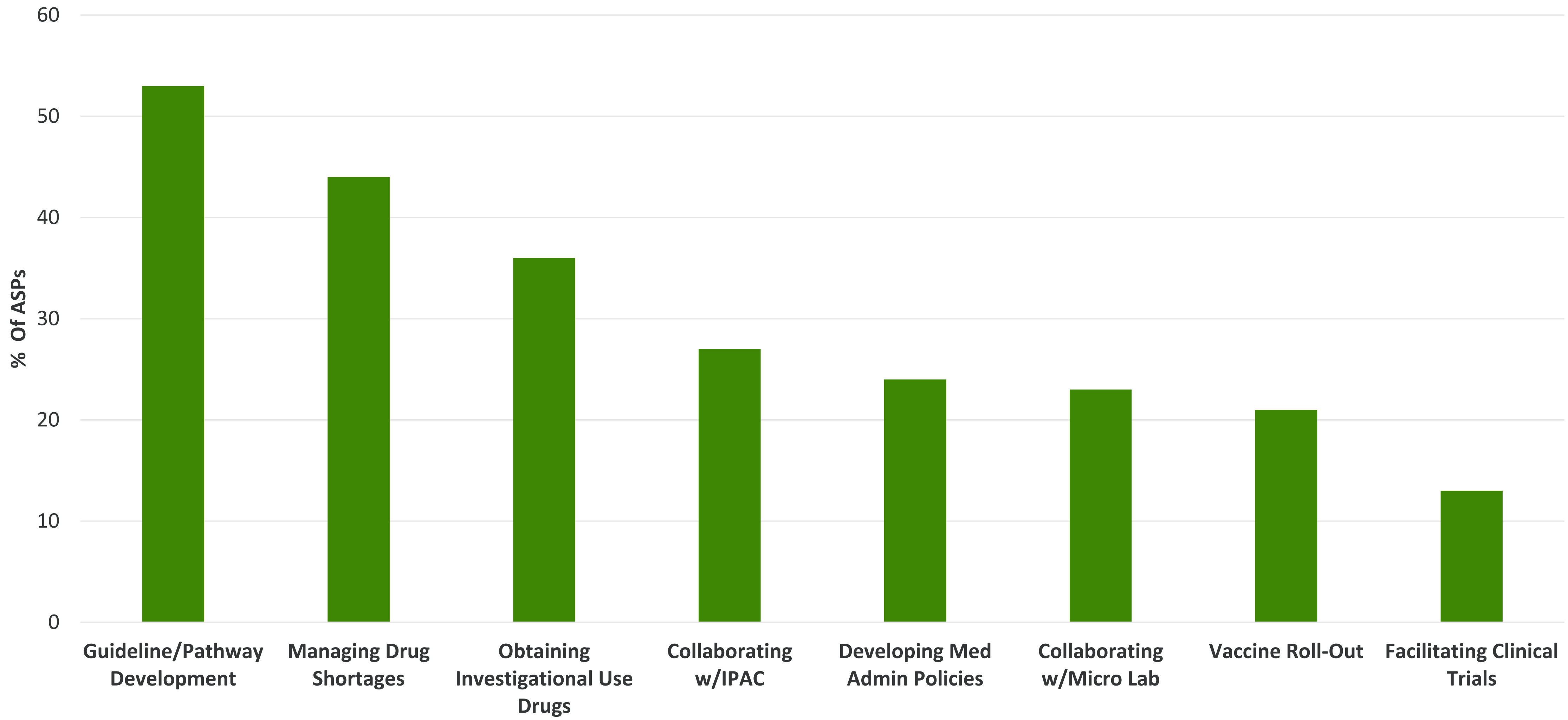
Ontario Hospital ASP Involvement in Pandemic Response – Preliminary Insights

- These questions only apply to hospitals with a formalized ASP (or in the process of formalizing their ASP); timeframe for these questions was March 2020 to fall 2021.
- 83% of ASPs indicated there was no change in the amount of FTE dedicated to ASP during this timeframe; the remainder indicated a decrease except for 1 where there was an increase in pharmacist FTE.
- Survey asked whether the ASP (specific stewardship program, not pharmacy or infectious disease department) had been involved in a) specific pandemic-related activities and b) whether specific core activities that were implemented pre-pandemic were continued, modified or suspended.
- Respondents provided a lot of rich insights via free-text comments; this data has not yet been analyzed.

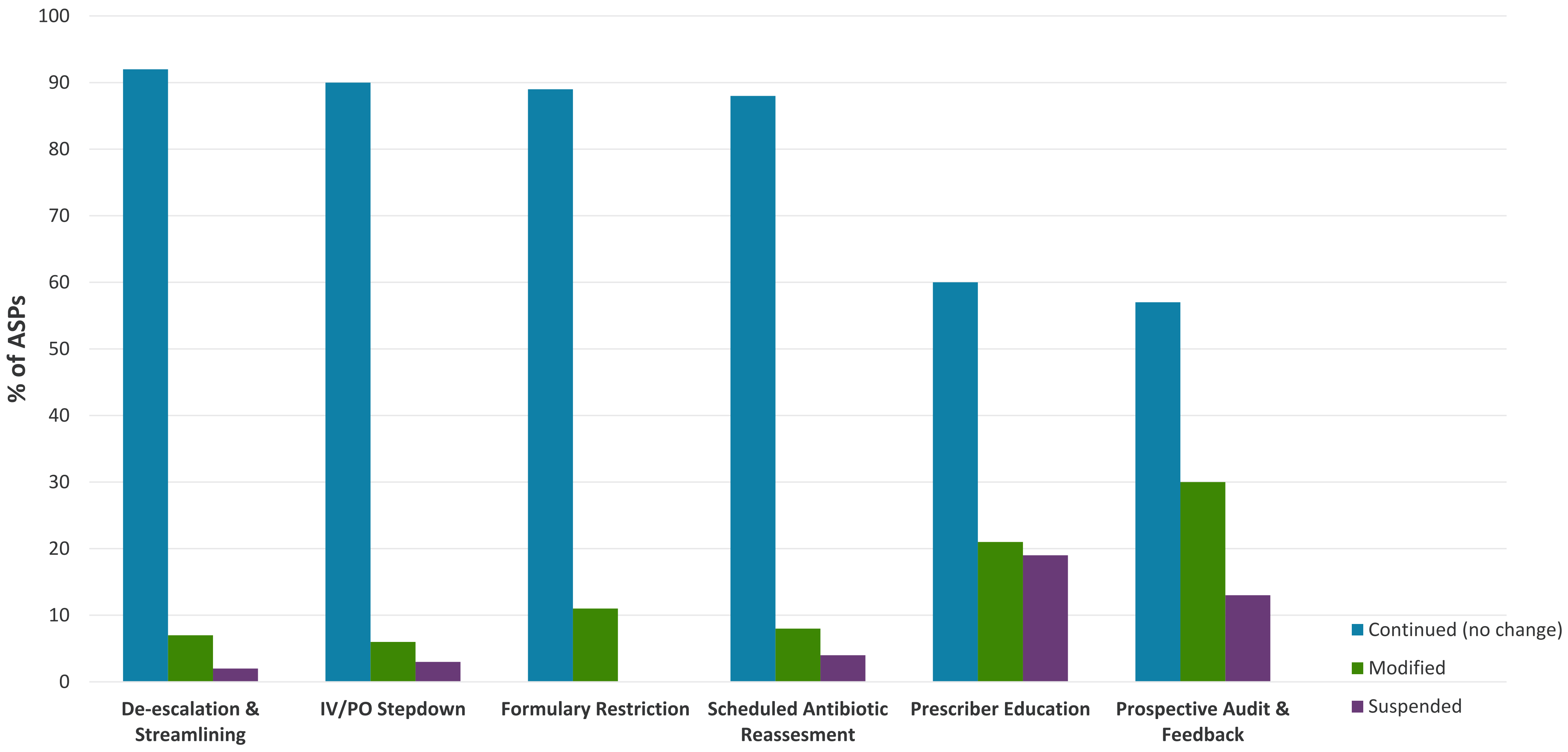
Involvement of ASPs in assessment of patients with COVID-19



Ontario ASPs have made significant contributions to Pandemic Preparation/Response Activities



Many ASPs continued with core activities during the Pandemic



Summary & Next Steps

- The number of organizations with formalized programs and designated resources/funding appears similar to 2018.
- Despite minimal changes in designated resources/funding during the pandemic, ASPs have made significant contributions to supporting Pandemic response while maintaining core activities
  - Analysis of free-text comments to yield additional insights.
- Final analysis is pending and will include AMU and AMR
  - **It's not too late to participate!** Responses submitted by November 30 2021 will be included in final analysis. Email asp@oahpp.ca for more information.
  - What questions do you have about hospital ASPs in Ontario that we could potentially answer from this data?
- Integration of survey results (for those that opted-in) into online ASP Comparison Tool targeted for March 2022.
  - Upgrades to tool features currently underway!

Ontario Agency for Health Protection and Promotion (Public Health Ontario). Ontario Antimicrobial Stewardship Program (ASP) comparison tool [Internet]. Toronto, ON: Queen's Printer for Ontario; 2021 [modified 2021 Mar 30; cited 2021 Nov 18]. Available from: https://www.publichealthontario.ca/en/health-topics/antimicrobial-stewardship/asp-comparison-tool

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