

# Infection Prevention and Control

## RESEARCH REVIEW™

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Issue 8 – 2020

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- Community-acquired *S. aureus* in children:
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#### Abbreviations used in this issue

**COVID-19** = coronavirus disease-2019

**ED** = emergency department

**ESBL-*E. coli*** = extended-spectrum  $\beta$ -lactamase producing *Escherichia coli*

**IPC** = infection prevention and control

**MRSA** = methicillin-resistant *Staphylococcus aureus*

**PCR** = polymerase chain reaction

**PPE** = personal protective equipment

**SARS** = severe acute respiratory syndrome

**SARS-CoV** = severe acute respiratory syndrome coronavirus

**SARS-CoV-1** = severe acute respiratory syndrome coronavirus-1

**SARS-CoV-2** = severe acute respiratory syndrome coronavirus-2



## Welcome

to the latest issue of **Infection Prevention and Control Research Review**.

This issue features two papers that highlight the disease burden, ethnic disparities, and household transmission characteristics of community-acquired *Staphylococcus aureus* in children. Other bacterial-based papers cover the association between population-level exposures and levels of MRSA and ESBL-*E. coli* infections and the impact of changes in antimicrobial stewardship in Christchurch hospitals. Notable COVID-19-related selections include more research on aerosol and fomite transmission of SARS-CoV-2, a qualitative study of factors that affect PPE use by healthcare workers, and a report on how expanding the official case definition enabled a hospital emergency room to identify more COVID-19 patients than it otherwise would have.

We hope that you learn something new from reading this issue of **Infection Prevention and Control**. Please keep sending your comments and feedback.

Best regards,

Dr Chris Tofield

**Medical Advisor, Research Review**

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### Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1

**Authors:** van Doremalen N et al.

**Summary:** This letter to the editor was received from researchers who evaluated the stability of SARS-CoV-2 and SARS-CoV-1 (the most closely related human coronavirus) in artificially-generated aerosols and on five different surfaces and estimated their decay rates using a Bayesian regression model. SARS-CoV-2 remained viable and infectious in aerosols for 3 hours and on plastic and stainless steel for <72 hours suggesting that aerosol and fomite transmission of SARS-CoV-2 is plausible. The stability of SARS-CoV-2 was found to be similar to that of SARS-CoV-1 indicating that differences in the epidemiologic characteristics of these viruses probably arise from other factors such as high viral loads in the upper respiratory tract and the potential for SARS-CoV-2-infected individuals to shed and transmit the virus while asymptomatic.

**Comment (MA):** This is a well conducted study that is important in the understanding of transmission routes of SARS-CoV-2. As opposed to PCR positivity, the methodology looks for culturability of the virus, probably a better indicator of potential transmissibility. With regard to fomites (plastic, stainless steel, copper, and cardboard), it found SARS-CoV-2 survived longest on plastic. Yet another reason to move towards a plastic-free society! The study also showed survivability of SARS-CoV-2 for up to 3 hours in artificially-generated aerosols, offering the theoretical possibility of aerosol transmission. However, as a more "real-life" [study](#) did not provide any evidence to support this hypothesis I don't think the question of aerosol transmission of SARS-CoV-2 has been completely settled yet. Nevertheless, this study may provide some putative evidence for the use of N95 masks in high-risk healthcare settings.

**Reference:** *N Engl J Med.* 2020;382(16):1564–1567

[Abstract](#)



#### Covid-19 Response: Our heartfelt thanks

All of us at Research Review want to thank you for the part you are playing in the Covid-19 crisis. Our hats go off to you, and we are proud to be associated with you. Our role in all of this is to support you by keeping you informed and up to date as much as we possibly can.

#### Independent commentary by Michael Addidle

Michael Addidle is a UK trained Clinical microbiologist now working at both Pathlab and ESR laboratories in New Zealand. He holds fellowships in general medicine and clinical microbiology. He is involved in infection control in both public and private hospitals throughout the Bay of Plenty and Waikato regions. Michael has a keen interest in the pivotal role of the diagnostic laboratory in good diagnostic and antimicrobial stewardship.





## Community-acquired invasive *Staphylococcus aureus*: uncovering disparities and the burden of disease in Auckland children

**Authors:** Vogel AM et al.

**Summary:** This retrospective, cross-sectional analysis identified 295 Auckland children (aged 0–14) years hospitalised with community-onset invasive *Staphylococcus aureus* isolated from a normally sterile site. Clinical records and coroner’s reports were reviewed to determine clinical syndromes and exclude nosocomial infections. The average annual incidence of *S. aureus* was 18.6 per 100,000: 44.3 per 100,000 for Pacific populations; 24.3 per 100,000 Māori; and 8.8 per 100,000 for NZ European and other. The incidence of *S. aureus* was almost 10-fold greater for Pacific infants than for non-Māori/non-Pacific (113.4/100,000 population vs 11.8/100,000). Multivariate analysis identified a higher risk of admission in Pacific children, males, and those living in areas of high deprivation.

**Comment (MA):** This is an important study demonstrating the total burden of invasive community-acquired *S. aureus* infection in Auckland children, and highlights the morbidity and occasionally mortality associated with invasive *S. aureus* respiratory disease. Few conditions reflect more acutely the ethnic disparities in infection rates. From this study, an infant (<1 year old) from the Pacific Islands is 10-times more likely to suffer invasive *S. aureus* infection than one from a non-indigenous population. That is quite shocking. Personally, I think we need more formalised surveillance of *S. aureus* invasive skin and soft tissue infection in NZ, both from a laboratory and epidemiological point of view. When the COVID-19 situation starts to settle, this will be a particular focus for me. It is also of note that only two-thirds of cases of community-acquired invasive *S. aureus* infection were bacteraemic, showing that *S. aureus* bacteraemia cannot be used alone for such surveillance in the laboratory setting.

**Reference:** *J Paediatr Child Health.* 2020;56(2):244–251  
[Abstract](#)

## Longitudinal, strain-specific *Staphylococcus aureus* introduction and transmission events in households of children with community-associated meticillin-resistant *S. aureus* skin and soft tissue infection: a prospective cohort study

**Authors:** Mork RL et al.

**Summary:** These US researchers characterised longitudinal strain-level *Staphylococcus aureus* transmission dynamics in households of children with community-associated MRSA skin and soft tissue infection. A total of 1267 strain acquisition events were observed across household members, pets, and environmental surfaces. There were 510 introductions of novel strains into households and 602 transmissions within households. Frequent handwashing reduced the likelihood of novel strain introduction into the household. Transmission recipients were less likely to own their homes and were more likely to share bedrooms with strain-colonised individuals, live in homes with higher environmental *S. aureus* contamination burden, and report interval skin and soft tissue infection. Transmission sources were more likely to share bath towels. Although pets were often transmission recipients, they were rarely the sole transmission source.

**Comment (MA):** This complex paper takes some reading!, but it is nevertheless important given the NZ public health problems with skin and soft tissue infection caused by *Staphylococcus aureus*, and the consequent burden of invasive infection as outlined in the [Auckland study](#). The study reflects the importance of the home environment in *S. aureus* transmission and identifies possible targets for interruption. Having a large family myself, I understand the difficulty in instigating practical measures to reduce potential transmission. Fresh towels and bedsheets are all very well, but as a lot of environmental contamination is a direct result of poor hand hygiene, I still think meticulous hand hygiene is the key here. I would like to see a trial showing the effect of clinician-prescribed alcohol hand gel for families where recurrent *S. aureus* skin and soft tissue infection is an endemic problem. In the COVID era, I think a lot of things in our everyday life are going to start to become “contactless”, i.e. switches, taps, toilet door handles, etc., not just in the public setting, but in the home environment as well. This might help also.

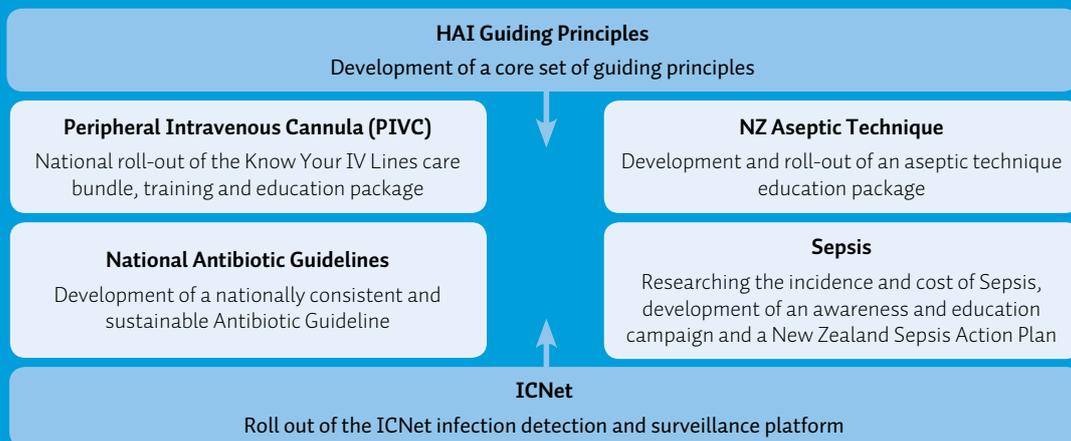
**Reference:** *Lancet Infect Dis.* 2020;20(2):188–198  
[Abstract](#)

## Preventing Healthcare Associated Infections



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## Population-level exposures associated with MRSA and ESBL-*E. coli* infection across district health boards in Aotearoa New Zealand: an ecological study

**Authors:** Blakiston MR & Freeman JT

**Summary:** An ecological study design was used to describe the link between the incidence of MRSA and ESBL-*E. coli* infection and population-level variables in 18 geographically distinct populations (as defined by DHBs). The incidence of both MRSA and ESBL-*E. coli* infection were found to be positively correlated with household crowding and community antimicrobial use. MRSA infection was also positively correlated with socioeconomic deprivation, age <5 years, Māori ethnicity, and Pacific ethnicity. ESBL-*E. coli* infection was also positively correlated with Asian ethnicity, Pacific ethnicity, and overseas-born new arrivals.

**Comment (MA):** This study offers an interesting insight into population-level exposures and their correlation with levels of MRSA and ESBL multidrug-resistant organisms (MDRO). With regard to the population variables studied, antimicrobial prescribing and crowded housing are the only ones that we could actively do something about. However, other correlations with ethnicity, age, migration, and socioeconomic status offer some evidence as to where public health funding could be specifically directed with regard to reduction of MDRO prevalence. The combination of high community antimicrobial use in patients who live in crowded households requires further and more specific study in the NZ context, and whether the combination of selection pressure and transmission potential are operating in a synergistic fashion in this particular setting.

**Reference:** *N Z Med J.* 2020;133(1510):62–69  
[Abstract](#)

## A persuasive approach to antimicrobial stewardship in Christchurch hospitals produced a sustained decrease in intravenous clarithromycin dosing and expenditure via a switch to azithromycin orally

**Authors:** Gardiner SJ et al.

**Summary:** This paper reports the outcomes resulting from Canterbury DHB guidelines for empiric treatment of community-acquired pneumonia being changed to prioritise oral azithromycin over IV clarithromycin. Macrolide usage and expenditure was compared for the four years pre- and post-intervention. Mean annual clarithromycin IV use declined by 72% post-intervention while oral azithromycin use increased by 833%. Concurrently, oral clarithromycin use declined by 91% and roxithromycin by 71%. Mean annual total macrolide use declined by 21%. Macrolide expenditure declined by 69%, driven primarily by avoided IV administration.

**Comment (MA):** I included this paper as antimicrobial stewardship is now becoming a pivotal part of infection prevention and control, and it is one of my passions! The actual drug (clarithromycin) studied in this article is essentially only an example of what is possible in this field. The scope for similar initiatives in the hospital setting is wide ranging, think twice daily versus three-times daily metronidazole, oral versus IV clindamycin, oral versus IV ciprofloxacin, just for starters. The linchpin in such endeavours, however, is the antimicrobial pharmacist. In the COVID era, DHBs will be doubling down their efforts to make cost savings in their everyday practice. Employment of an antimicrobial pharmacist in every medium to large hospital is for me an absolute necessity. The approach in this particular paper is described as “persuasive” but I would say it is more “carrot and stick” in terms of increased access to smartphone guidelines and decreased access to the antibiotics in question.

**Reference:** *N Z Med J.* 2020;133(1512):22–30  
[Abstract](#)

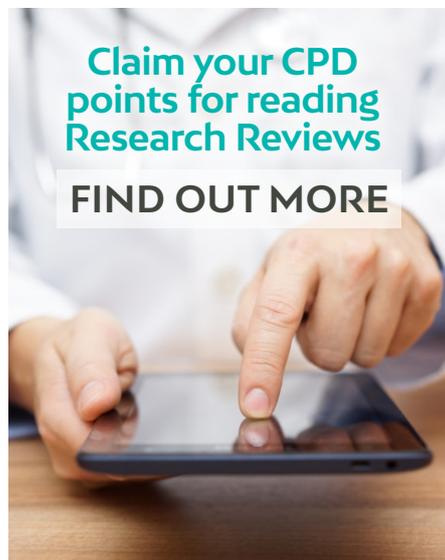
## A qualitative study of factors affecting personal protective equipment use among health care personnel

**Authors:** Harrod M et al.

**Summary:** This qualitative study used observation and focus groups at two medical centres in the US to better understand PPE use decision making by healthcare personnel. Healthcare workers factored in perceived risk related to certain organisms and work tasks when deciding to use PPE. Healthcare personnel use of PPE was also affected by organisational processes (e.g. policies that were not applied uniformly) and environmental factors (e.g. clean vs contaminated space).

**Comment (NG):** It is important to verify that all healthcare workers understand the IPC practices and consistently follow the policies for the facility they work. The idea of combining direct observations and focus group discussions is highly informative because it gives insight into the perceptions of staff, not just a snapshot of their behaviours. The variation observed and discussed can lead to the ‘why’ a protocol is not followed consistently and enable targeted improvement activities to mitigate the variation in practice. Some of the perceptions revealed by healthcare personnel during the focus group discussions highlighted the opportunity for education and training related to IPC in general (e.g. standard precautions vs transmission-based precautions or risk of self-contamination and transmission, etc.) and why the steps in the policy exist. It is key to make sure healthcare workers participating in focus groups are comfortable to talk openly and truthfully. This methodology can be utilised for various processes or protocols in a hospital.

**Reference:** *Am J Infect Control.* 2020;48(4):410–415  
[Abstract](#)



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### Independent commentary by Nikki Grae

Nikki Grae has been the senior advisor for the infection prevention and control programme at the Health Quality & Safety Commission since 2016. She has 12 years of infection prevention, quality, and patient safety experience in the healthcare sector. Prior to working at the Commission, she managed and led the infection prevention and patient safety programmes for a health system in the U.S. Nikki has also worked as a research scientist in cancer biology and microbiology. She has a Master of Science degree in microbiology. Nikki relocated to New Zealand to enjoy the friendly people and spectacular scenery while continuing her career in infection prevention and control.





## Cochrane Corner: Coronavirus (COVID-19): infection control and prevention measures

**Authors:** Jordan V et al.

**Summary:** This collection of Cochrane Reviews brings together meta-analyses that are directly relevant to the prevention of COVID-19, including reviews relevant to WHO interim guidance. It is one of a [series of collections on COVID-19](#) that are updated on an ongoing basis.

**Comment (NG):** As the COVID-19 pandemic has raised the profile of IPC and importance of such practices, this special collection of systematic reviews provides insight into interventions that were successful in preventing healthcare-associated infections and the relevant behavioural factors to ensure consistent practice of those interventions. This collection of reviews is updated and added to as other topics related to IPC measures are identified and can be used to inform our response to the COVID-19 pandemic. One of the reviews of qualitative research provides a list of factors that may influence healthcare workers' ability and willingness to follow IPC guidelines and may be worth considering in the absence of research conducted at your local hospital. One thing that is apparent in reviewing this collection of reviews is that there is a genuine need for more studies related to IPC practices to be published.

**Reference:** *J Prim Health Care.* 2020;12(1):96–97

[Abstract](#)

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## Containing COVID-19 in the emergency room: the role of improved case detection and segregation of suspect cases

**Authors:** Wee LE et al.

**Summary:** A Singapore hospital emergency department (ED) applied broader suspect case criteria than the official definition for better detection of COVID-19 at triage to help minimise nosocomial transmission. A total of 1,841 cases presenting with respiratory syndromes required admission over a 12-week study period. Seventy cases of COVID-19 were subsequently confirmed, with 59 being picked up at triage as they fulfilled suspect case criteria. Of these cases, 34 met the official screening criteria with another 25 being picked up by the broader internal screening criteria. The cumulative sensitivity of the internal screening criteria was 84.3% (95% CI: 73.6–91.9%) compared with 48.6% (95% CI: 36.4–60.8%) for the official screening criteria. No cases of nosocomial transmission from intra-ED exposure were identified.

**Comment (NG):** Hindsight is 20/20 and that is what the Singapore hospital in this study used to manage the potential COVID-19 patients entering their ED. This hospital expanded the official case definition to include additional screening criteria, which enabled them to increase the sensitivity of criteria and identify COVID-19 patients that would not have been identified with the official case definition. They also risk-stratified the areas of their ED by implementing infrastructural changes to ensure adequate spacing between patients and staff but also cohorting patients based on their symptom presentation. Additional variations among the areas were the specific PPE use and cleaning protocols.

The effectiveness of a case definition depends on context and the user. However, in order to accurately identify COVID-19 cases, that definition may need flexibility by allowing physicians to use their clinical suspicion. A balance is critical to achieve high sensitivity for identifying COVID-19 patients but also conserve resources for testing and PPE usage. The case definition in NZ has been adapted as the majority of cases have shifted from imported to local transmission. Singapore learned from their experience with SARS in 2003 and many countries such as NZ will learn from this current COVID-19 outbreak to better prepare for the next one.

**Reference:** *Acad Emerg Med.* 2020 Apr 12 [Epub ahead of print]

[Abstract](#)

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