

Infection Prevention and Control

RESEARCH REVIEW™

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Issue 14 – 2021

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Abbreviations used in this issue

COVID-19 = coronavirus disease 2019
HAI = healthcare-associated infection
HCW = healthcare worker
IPC = infection prevention and control
LRTI = lower respiratory tract infection
MDRO = multidrug-resistant organism
PPE = personal protective equipment
RAT = rapid antigen test
SARS-CoV-2 = severe acute respiratory syndrome coronavirus-2
XDRO = extensively drug-resistant organism



Welcome to the latest issue of Infection Prevention and Control.

Much of this issue is dedicated to COVID-19 research. One study investigates the effectiveness of SARS-CoV-2 RATs as a screening method for rapid diagnosis and targeted admission for COVID-19. Other studies investigate whether a universal facemask policy reduces the risk of HCWs acquiring COVID-19, the effect of COVID-19 on HAIs, and the relevance of so-called aerosol generating procedures for transmission of SARS-CoV-2.

Non-COVID-19 selections include evaluations of patient characteristics at hospital admission that increase risk of developing HAIs, antimicrobial stewardship practices related to the use of molecular respiratory testing for LRTIs in acute care, and digital interventions to improve hygiene practices in the community.

We hope that you enjoy reading and find informative the selections in this issue of **Infection Prevention and Control**. As ever, we welcome your feedback and suggestions.

Best regards,

Dr Chris Tofield

Medical Advisor, Research Review

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Comparison of five SARS-CoV-2 rapid antigen detection tests in a hospital setting and performance of one antigen assay in routine practice: a useful tool to guide isolation precautions?

Authors: Van Honacker E et al.

Summary: These Belgian researchers evaluated the diagnostic performance of five SARS-CoV-2 RATs (Biosynex, Biotical, Orient Gene, Panbio, and SD Biosensor) and describe the performance the SD Biosensor assay following its implementation in a hospital emergency department. The sensitivity and specificity of the RATs were analysed on 60 real-time reverse transcriptase polymerase chain reaction-confirmed SARS-CoV-2-positive samples, 24 SARS-CoV-2 RNA-negative samples, and 16 samples positive for other respiratory pathogens. The SD Biosensor RAT was implemented as a screening method for rapid diagnosis and targeted admission. In terms of the validation results, the sensitivity of the five RATs ranged from 88.9% to 100% for samples and their specificity ranged from 46.2% to 100%. During the 4-month implementation period, 4,195 SD Biosensor RATs were performed. Due to the rapid positive result of the RAT, 157 patients were transferred directly to the COVID-19 cohort ward instead of the regular ward (n=47) or temporary COVID-19 ward (n=110).

Comment (MA): There is no doubt in my mind that COVID-19 RATs will soon be available in NZ, rightly or wrongly. There are lots of papers like this one validating these tests. There are hundreds of different RATs on the market, with wide variation in performance. This [WHO document](#) summarises COVID-19 RATs, their potential applications, and expected performance criteria. This particular study demonstrates that when RATs are used in a real-life setting, they may not achieve the same sensitivity as with controlled validation studies. The study also highlighted that, although specificity is generally good, subjective interpretation of test results by humans may increase false positives (over-calling of faint lines on the test strip). The use of automated "readers" may help to alleviate these issues. It also noted that if a positive RAT result is being used to cohort a patient with other positive patients, then a false positive result may put the "truly negative" patient at increased risk. There are so many things to consider with RATs. We should look to other countries that have gone before us to ascertain what applications work and what does not.

Reference: *J Hosp Infect.* 2021;114:144–152

[Abstract](#)



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Diagnostic and antimicrobial stewardship with molecular respiratory testing across the SHEA Research Network

Authors: Claeys KC et al.

Summary: These investigators surveyed acute care hospitals that are part of the Society for Healthcare Epidemiology of America (SHEA) consortium to investigate diagnostic and antimicrobial stewardship practices related to the use of molecular respiratory panel testing in adults with LRTIs. Use of rapid respiratory panels was reported by the majority of respondents. However, associated stewardship practices were uncommon and the real-world impact of respiratory panels could not be reliably quantified.

Comment (MA): Molecular respiratory testing, especially with “extended” respiratory viral panels (RVPs), has become increasingly established in diagnostic laboratories throughout NZ over the last decade. However, these assays are still expensive, and diagnostic stewardship around these testing modalities is still very much in its infancy. In my anecdotal opinion, there are a lot of these tests being performed in both my laboratory and elsewhere in NZ that are almost certainly unnecessary. This study looked at usage in US/Canada laboratories. The minority of participating laboratories implemented restrictions on the use of these panels, which may to a large extent reflect the laboratory funding model that is in place for US/Canada, which may disincentivise restriction of laboratory testing. In addition, the study showed the minority of laboratories were auditing the antimicrobial stewardship impact of the testing.

My “beer mat” calculations suggest that we are now spending over \$1 million a year on such tests in NZ, and this amount is increasing year on year. We need to look at national standardisation of acceptance criteria for such tests, along with subsequent clinical audit of such criteria. But where are we going to find the time for that...

Reference: *Infect Control Hosp Epidemiol.* 2021;42(8):1010–1013
[Abstract](#)

Association between implementation of a universal face mask policy for healthcare workers in a healthcare system and SARS-CoV-2 positivity testing rate in healthcare workers

Authors: Wang DD et al.

Summary: These US researchers evaluated the association of a universal facemask policy with SARS-CoV-2 infection in HCWs in a COVID-19 hotspot in the US. The daily number of symptomatic HCWs tested, SARS-CoV-2 positivity rates, and HCW job-descriptions were collected before and after implementation of the universal facemask policy (on 26 March 2020). Between 12 March and 10 August 2020, 19.2% of HCW were symptomatic for COVID-19 and underwent SARS-CoV-2 testing. A single change point was identified: ≈28–30 March (95% probability). The odds of a tested HCW having a positive result doubled every 4.5 to 7.5 days before the change point whereas they halved every 10.5 to 13.5 days after the change point.

Comment (MA): This pre-vaccine, pre-Delta study took place in Michigan, USA during the first six months of the pandemic. Clearly it is a difficult study to undertake, and to be honest I would not put too much weight on the results. The study showed distinct temporal “change points” in maximum positivity rates between HCWs and the general population, but to attribute this specifically to implementation of universal facemask use, amongst several other infection control interventions that would have happened at the same time (other PPE, virtual consults, etc) is all a bit speculative. At least the study acknowledges this in the discussion section. Interestingly, the greatest declines in positivity rates post-intervention were in nurses, healthcare assistants, and administration staff whereas there was no significant impact for physicians. The reasons for this are again speculative, but it does provide light evidence for universal mask use in both clinical and non-clinical staff in the healthcare setting. I do not know how translatable all this is to NZ and its current situation, but I cannot visualise a repeat study getting through the ethics committees!

Reference: *J Occup Environ Med.* 2021;63(6):476–481
[Abstract](#)

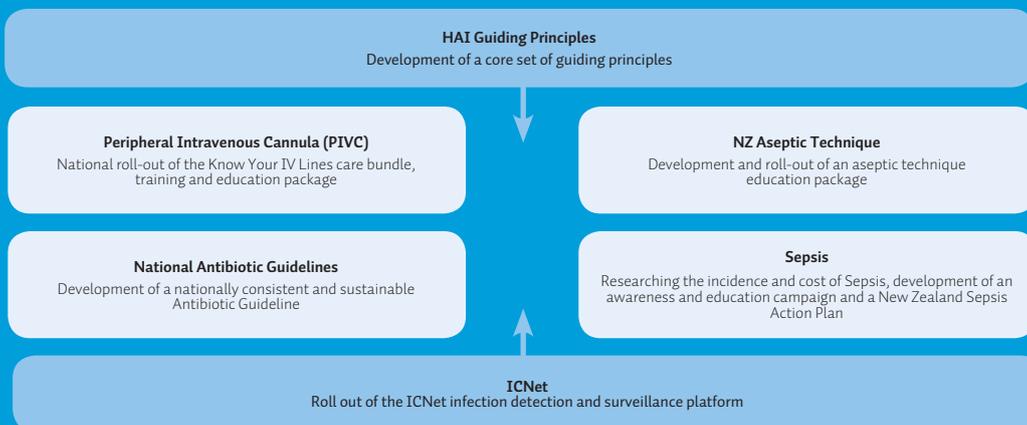
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Effectiveness of digital interventions to improve household and community infection prevention and control behaviours and to reduce incidence of respiratory and/or gastro-intestinal infections: a rapid systematic review

Authors: Gold N et al.

Summary: This literature review was undertaken to evaluate the evidence for digital interventions to improve hygiene practices within the community. Eligible trials had to have evaluated a uniquely digital component of an intervention and only target diseases with transmission mechanisms similar to COVID-19. Study designs were limited to randomised controlled trials, controlled before-and-after trials, and interrupted time series analyses. Six of seven studies that met the inclusion criteria reported successfully improving self-reported hygiene behaviour or health outcomes. However, only one of the six trials, 'Germ Defence', confirmed improvements using the objective measures of reduced consultations and antibiotic prescriptions. Settings included kindergartens, workplaces, and service station restrooms. Delivery modes included WeChat, website, text messages, audio messages to mobiles, electronic billboards, and electronic personal care records. Only the 'Germ Defence' trial was judged to be at low risk of bias. The most common concerns included lack of detail about the randomisation, possible bias in the reporting of behavioural outcomes, and possible selective reporting of results.

Comment (MA): This systematic review provides evidence for the effectiveness of digital intervention in improving compliance with infection control messages/policies. However, it does not mention the concept of "reminder fatigue", i.e. if we become overburdened with too many texts/emails/social media alerts then the relative impact of each individual alert will diminish. Importantly, the study does touch on the concept that what works in one culture does not necessarily work in another. Unfortunately, we have seen this clearly demonstrated locally in the COVID-19 vaccine rollout in NZ. Nevertheless, I think we should always be looking for ways in which digital interventions could improve infection control compliance, an obvious target being hand hygiene. We should also acknowledge that younger generations do not necessarily respond best to emails or texts, but may be more receptive to notifications on social media accounts such as WhatsApp, Facebook, etc. I have anecdotal experience of this with my own children!

Reference: *BMC Public Health*. 2021;21(1):1180

[Abstract](#)

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A cross sectional study of organizational factors and their impact on job satisfaction and emotional burnout in a group of Australian nurses: infection control practitioners

Authors: Page K and Graves N

Summary: This cross-sectional study used an online survey to measure a range of organizational factors to document the working conditions of Australian infection control practitioners (ICPs) and show how these are linked to job satisfaction and emotional burnout. One hundred and fifty-three ICPs from 50 of the largest public hospitals in Australia completed the survey. The results revealed that ICPs are moderately to highly satisfied with their job but reported high levels of emotional burnout, time pressure, and cognitive demands. Low job satisfaction was associated with less job control, lack of organizational support, and poor communication. Emotional burnout was associated with high time pressure and cognitive demands coupled with poor communication.

Comment (MA): It looks like this study was undertaken and written pre-COVID-19. It would be interesting to repeat the study now and reassess levels of job satisfaction and burnout amongst ICPs! The main worry with studies like this is participation bias, i.e. the people that are the most disillusioned are ones most likely to participate in such a survey. Participation was relatively high, however, with 71% of invitees completing the survey, which may mitigate such effects. It would also have been good to ask or independently measure ICP:bed ratios for each of the participating nurses. This would have facilitated the utility of a study like this when making a business case for increased resourcing. This study involved Australian ICPs and it would be interesting to carry out a similar study in NZ. Burnout amongst many different sectors of HCs, including ICPs is a genuine risk during a pandemic era. The "Catch 22", however, is finding time to perform such studies at times like this when they are most required.

Reference: *BMC Health Serv Res*. 2021;21(1):441

[Abstract](#)

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.

ElimIn8 Educational Series on Hepatitis C

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(*Cure means no detectable HCV RNA is found in a blood test taken 12 weeks after treatment has finished.)

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Personalized infection prevention and control: identifying patients at risk of healthcare-associated infection

Authors: Stewart S et al.

Summary: This incidence survey conducted in two hospitals in Scotland was undertaken to determine intrinsic characteristics of adult patients at hospital admission and extrinsic events, during the two years preceding admission, that increase risk of developing a HAI. The analysis included 63,890 eligible admissions to the study hospitals during the study period: 44,399 for the teaching hospital and 19,491 for the general hospital. A total of 893 admissions had one or more HAI: 822 in the teaching hospital and 71 in the general hospital. Being treated in a teaching hospital, increasing age, emergency admission, and comorbidities of cancer, cardiovascular disease, chronic renal failure, and diabetes were identified as the most significant risk factors present on admission for the acquisition of HAI. The relative risk of developing a HAI increased with admission to an intensive care unit, high-dependency unit, and surgical specialties. There was also an increased risk associated with surgeries within ≤ 30 days prior to admission and prior hospital stays of > 2 weeks during the previous two years.

Comment (NG): This study determined a set of intrinsic characteristics at hospital admission and extrinsic events that increased a patient's risk of developing a HAI. One of the limitations of this study is that only positive microbiology reports were reviewed for suspected HAI but not all HAI surveillance criteria require a positive microbiology result. While the majority of HAIs have positive microbiology, it is important to know that not all HAIs would have been captured in this dataset and hence potentially could change the relative risk of each patient. This study found that being treated at a teaching hospital, increased age, emergency admission, and comorbidities of cancer, cardiovascular disease, chronic renal failure, and diabetes increased the risk of developing a HAI. While most of these factors are probably not surprising to anyone, this study includes a whole-hospital incidence study which is rare.

Risk assessment at the patient level is necessary to ensure care is patient-centred. However, there are fundamental IPC practices that should be followed for all patients, regardless of their intrinsic or extrinsic risk factors. I wonder if a level of complacency for the basic IPC practices would inadvertently occur for those patients that did not have the identified risk factors due to an increased focus on distinguishing specific patients with intrinsic and extrinsic risk factors.

While it is important to continue to perform these types of studies to build evidence of factors that may inform targeted interventions that should be applied to a specific group of high-risk patients, it is essential to ensure every patient receives conventional IPC practices. If a particular set of IPC interventions are costly (beyond basic IPC practices such as hand hygiene, aseptic technique, PPE usage, etc.), this type of evidence may justify the implementation of targeted interventions for those patients that meet a set of risk factors on admission. As this type of evidence accumulates, the optimal way for it to be integrated into patient care would be an automated alert system at the point of admission using electronic records containing the relevant risk factor data.

Reference: *J Hosp Infect.* 2021;114:32–42

[Abstract](#)

Independent commentary by Nikki Grae

Nikki Grae is a Senior Manager at the Health Quality & Safety Commission. She has an interest in infection prevention and quality improvement. 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.



The impact of coronavirus disease 2019 (COVID-19) on healthcare-associated infections in 2020: a summary of data reported to the National Healthcare Safety Network

Authors: Weiner-Lastinger LM et al.

Summary: To determine the effect of the COVID-19 pandemic on the incidence of HAIs in US hospitals, these researchers calculated national- and state-level standardised infection ratios (SIRs) for each quarter in 2020 and compared them with those from 2019. Central-line-associated bloodstream infections (CLABSIs), catheter-associated urinary tract infections (CAUTIs), ventilator-associated events (VAEs), select surgical site infections, and *Clostridioides difficile* and methicillin-resistant *Staphylococcus aureus* (MRSA) bacteraemia laboratory-identified events reported to the US National Healthcare Safety Network for 2019 and 2020 by acute-care hospitals were assessed. In 2020, there were significant increases in the national SIRs for CLABSI, CAUTI, VAE, and MRSA bacteraemia. The greatest increase was observed for CLABSI, with significant increases in VAE incidence and ventilator utilisation being observed across all four quarters of 2020.

Comment (NG): This study provides insight into the potential impact of COVID-19 hospitalisations on HAI incidence that other countries may experience due to altered staffing practices, increased critical care capacity, and modified use of PPE. While NZ's healthcare system is not the same as the largely privately funded system in the US, and we did not experience a similar burden on the health system as the US, there are some learnings that can be recognised for future outbreaks and pandemics.

The variation on hospitals reporting HAI data to the National Healthcare Safety Network throughout the pandemic makes it difficult to conclude the specific impact of COVID-19 on HAI incidence. However, when hospitals were reporting data in the same quarters in 2019 and 2020, significant increases in risk-adjusted CLABSI, CAUTI, VAE, and MRSA bacteraemia rates were seen in 2020. No significant increases of surgical site and laboratory identified *Clostridioides difficile* infections were identified. The increased VAEs are not surprising as many COVID-19 patients require ventilation at a longer than average duration. Device-associated bloodstream infections and urinary tract infections may have resulted from longer duration of devices and less compliance with evidence-based insertion and maintenance practices. This study highlights the need to build resiliency in IPC programmes to ensure other pressures (such as pandemics) that cause increased patient caseload, staffing challenges, and other operational challenges do not impact the implementation and effectiveness of standard IPC practices.

Reference: *Infect Control Hosp Epidemiol.* 2021 Sep 3;1–14. [Online ahead of print]

[Abstract](#)

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Aerosol generating procedures: are they of relevance for transmission of SARS-CoV-2?

Authors: Hamilton F et al.

Summary: These authors comment that while it is increasingly clear that transmission of SARS-CoV-2 via aerosol is possible, emerging evidence indicates that many currently defined aerosol-generating procedures (AGPs) in hospitals are unlikely to play a significant role in generation of infectious aerosol that poses a risk to HCWs. The authors propose that because the term AGP lacks validity infection control practitioners should instead focus on the most clear and present risk, which is close, physical exposure to people suspected, or known to have, COVID-19 for a prolonged time or where ventilation remains poor.

Comment (MB): This was an interesting commentary from a UK group who study aerosol generation. They highlighted the lack of good evidence supporting the term 'AGP' and proposed that the term be done away with. They note that coughing or increased respiratory exertion likely generate far more in the way of potentially infectious aerosols than many interventions termed AGPs. In our department, we have recently been discussing the potential downsides of transmission-based precautions from a safety perspective, e.g. less frequent patient observation in single rooms, so this commentary certainly provided food for thought. It may be that with such a focus on AGPs we are doing over-restrictive IPC precautions for some patients, whilst potentially under-appreciating the risks associated with coughing ward patients.

Reference: *Lancet Respir Med.* 2021;9(7):687–689

[Abstract](#)

A “resistance calculator”: simple stewardship intervention for refining empiric practices of antimicrobials in acute-care hospitals

Authors: Zilberman-Itskovich S et al.

Summary: These researchers conducted a retrospective cohort study of adult patients hospitalised with sepsis at a single medical centre with the objective of developing a simple electronic calculator to predict MDROs upon admission (UA) and XDRO infections during hospitalisation, and only require parameters to be entered that are readily available at the bedside. A total of 4,114 patients were included: 2,472 patients with sepsis UA and 1,642 with nosocomial sepsis. The MDRO UA score included ten parameters, and with a cut-off of ≥ 22 points, it had an area under the receiver operating characteristic curve (ROC AUC) of 0.85. The nosocomial XDRO score included seven parameters, and with a cut-off of ≥ 36 points, it had a ROC AUC of 0.87. The range of ROC AUCs for the validation data sets was 0.7–0.88 for the MDRO UA score and was 0.66–0.75 for the nosocomial XDRO score. The researchers have created a free web calculator that is available [here](#).

Comment (MB): I wanted to review this paper because this is something I have been doing at my hospital recently, trying to identify the main risk predictors for antimicrobial resistance in our population. Prior isolation of an MDRO was extremely highly predictive in our population, but beyond that the predictive value of other factors was not sufficient to alter antibiotic recommendations based on risk factors. This points to the fact that the score created by these researchers may work well in their setting but is likely to be highly population-dependent and would need to be validated in other populations before being used in them. A criticism I have of the paper is that they lumped all MDROs and XDROs together, whereas I would regard some as more important than others to cover with empiric therapy due to innate differences in pathogenic potential. In the future I think we will likely use a combination of decision support tools such as this, combined with more rapid microbiological diagnostics as ways to improve empiric antimicrobial prescribing.

Reference: *Infect Control Hosp Epidemiol.* 2021;42(9):1082–1089

[Abstract](#)

Timing and route of contamination of hospitalized patient rooms with healthcare-associated pathogens

Authors: Redmond SN et al.

Summary: This observational cohort study and simulations of pathogen transfer was conducted to investigate the timing and routes of bacterial contamination of the rooms of patients newly admitted to a Veterans' Affairs Hospital in the US. Interactions between the patients and personnel or portable equipment were observed, and cultures of high-touch surfaces, floors, bedding, and patients' socks and skin were collected for up to 4 days. Environmental cultures were positive for ≥ 1 pathogen in 10 of 17 rooms (59%), with cultures positive for methicillin-resistant *Staphylococcus aureus* (MRSA), *Clostridioides difficile*, and vancomycin-resistant enterococci (VRE) in the rooms of 10 (59%), 2 (12%), and 2 (12%) patients, respectively. For all 14 instances of pathogen detection, the initial site of recovery was the floor followed in a subset of patients by detection on sock bottoms, bedding, and high-touch surfaces. The simulations suggested that wearing slippers over hospital socks greatly reduced transfer of bacteriophage MS2 from the floor to hands and high-touch surfaces.

Comment (MB): Who would have thought the humble sock would now be implicated as a fomite for transfer of hospital-associated organisms! I did think this paper was good food for thought though. I have not given a huge amount of thought to floors as a source of pathogen transfer, but it does make mechanistic sense and is supported, at least in theory, by the findings in this study. They used a combination of sodium hypochlorite and UV light to clean rooms and floors prior to patient entry, which seemed to be very effective microbiologically, with no positive environmental cultures subsequent to cleaning. This then allowed them to demonstrate that the floor tended to be the first site of contamination, followed (again in very small numbers) by other high-touch areas of the environment. They also demonstrated, with simulation, that patients wearing slippers contaminated the environment far less. Perhaps we need to not only focus on hand hygiene, but on foot hygiene too!

Reference: *Infect Control Hosp Epidemiol.* 2021;42(9):1076–1081

[Abstract](#)

Independent commentary by Max Bloomfield



Max is an Infectious Diseases Physician and Clinical Microbiologist working at Capital & Coast DHB and Wellington Southern Community Laboratories. He has an interest in antimicrobial resistance, diagnostic stewardship and the microbial composition of sourdough bread. He trained at University College Hospital London and Wellington Hospital, gaining fellowship with the RACP and the RCPA. He has higher degrees from the University of Cambridge and Queen Mary University of London.

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