

INDUSTRY INNOVATIONS

Where Product Innovation Meets Best Practice

Volume 3, Number 1, Summer 2021

PPE

PERSONAL
PROTECTIVE
EQUIPMENT

Official Publication of
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ISSN #

DISPENSERS FOR

GOWNS

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COVERS

MASKS

N95

HEAD
COVERS

GLOVES

MASKS
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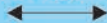
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“How we choose, how we use, and how we dispose of PPE are important elements that need to be considered as we aim to help keep healthcare workers, patients, residents and visitors within our healthcare system safe.”

Foreword

Dear IPAC Canada members,

Welcome to the Summer 2021 issue of *Industry Innovations*, IPAC Canada’s publication which showcases new and innovative technologies, and how their implementation can assist our activities preventing, controlling, and monitoring infectious diseases in healthcare settings.

On this issue’s theme

This past year has tested the boundaries of IPAC knowledge and best practice in a way that has rarely been experienced in modern times. The COVID-19 pandemic has truly highlighted the importance of constantly re-examining practice and adapting, as we continue to learn and experience novel diseases and healthcare challenges. Certainly, this is also true of how we use personal protective equipment (PPE) in healthcare so the topic of PPE seems a very timely one for our summer issue.

Routine Practices and Additional Precautions (RPAP) are foundational concepts in IPAC best practices in healthcare and, as part of RPAP, the use of PPE to prevent disease transmission remains key. How we choose, how we use, and how we dispose of PPE are important elements that need to be considered as we aim to help keep healthcare workers, patients, residents and visitors within our healthcare system safe. Increased PPE use in the last year has not only highlighted challenges with supply and fit of PPE, but also the environmental impacts with the increased need for disposal of used PPE.

Issue #3 of *Industry Innovations* features white papers that describe ways that industry is rising to the challenge and working to continually improve the functionality and fit of PPE and make advances in options for PPE disposal. Providing PPE that offers the right fit and efficacy for use for each healthcare worker is complex, so, it is exciting to see the industry tackle these issues in innovative and progressive ways. In this issue, you will see product development that may reduce the need for mask-fit testing, as well as technologies that simplify PPE disposal and help reduce environmental impacts.

Additional reading

Wearing PPE properly is an essential part of infection prevention and control and this relies on users knowing and understanding how to properly put on PPE and how to remove used PPE without becoming contaminated. The 2017 version of the Public Health Agency of Canada’s *Routine Practices and Additional Precautions for Preventing the Transmission of Infection in Healthcare Settings* is essential reading for anyone who is involved in IPAC, or for anyone who needs additional information on how to use PPE safely as part of good infection prevention and control practice.

We hope that this biannual series provides an interesting future-focused look at upcoming technologies in the IPAC world and gives frontline practitioners ideas about how their practices may evolve.

Feedback, recommendations for future issues, and submissions are always welcome.

Laura Farrell, BSc, BEd, CPHI(C), CIC
Guest Editor, *Industry Innovations*

Know Your Surgical Site Infection (SSI) Facts

Surgical Site Infection Risks

Surgical care is currently one of the world's most frequent healthcare interventions with the World Health Organization (WHO) estimating that in 2012, 312.9 million operations were performed globally. As the current world population ages and chronic conditions proliferate, *WHO also estimates that both the number of surgeries and range of surgical options will grow by at least the 38% reported over the eight years prior to this most recent data.*

While unable to estimate the actual burden of surgical site infection (SSI) due to the absence of reliable global data, WHO suggests that in low to middle income (LMI) countries, one third of surgical patients develop an SSI. In high-income countries reports suggest that depending on the type of surgery, the proportion of patients who develop an SSI ranges between 0.75%-9.5%. For some patients a SSI may be minor, however for many it may have catastrophic, life-long consequences including increased morbidity and even mortality.

World Health Organization. Global Guidelines for the Prevention of Surgical Site Infection. 2016; <http://www.who.int/gpsc/ssi-guidelines/en/> Accessed 10th November 2016.

Surgical gloves are typically sterile and used routinely by operating room personnel, anesthetic and intensive care staff and other clinicians as a barrier to prevent contact with blood and body fluids and also to stop contamination of a surgical wound, a critical aseptic field (such as that used for urinary or long-term vascular catheterization), a key part or a key site.

The risk to a glove's integrity varies according to factors such as the nature of the task at hand, the type of surgery, the surgical and aseptic skill of the wearer and their dominant hand, the type and particularly the sharpness of surfaces coming into contact with the glove(s) and the length of continuous time for which a glove or pair of gloves are worn and the mechanical stress to which they are subjected. Research into the causes and prevention of glove perforation is common with many investigators including Mistelli and colleagues, recommending that routine use of double gloves and systematic changing of the outer gloves at designated times, or stages intraoperatively would reduce the incidence of perforations.

They believe that this protocol would also simultaneously protect the wearer and reduce any bacterial load on the glove surface, thereby reducing the potential of



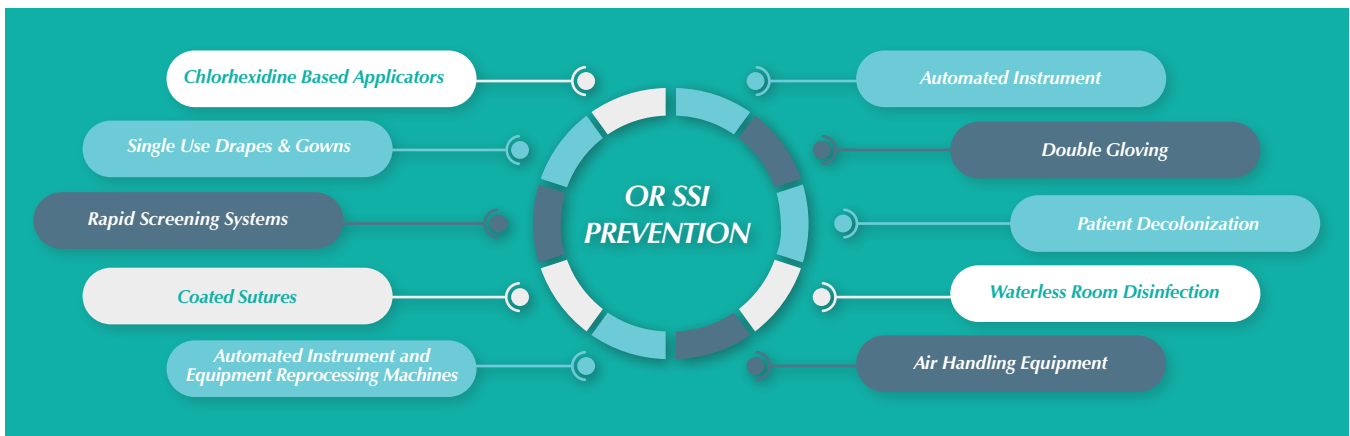
surgical site contamination. It is feasible that some operating room personnel underappreciate the risks associated with glove perforation because many, if not most, glove perforations remain either undetected, or are detected only at, or close to, the conclusion of a surgical procedure. Glove perforations can be either macro or microscopic, again limiting their early detection.

Daeschlein G, Kramer A, Arnold A, Ladwig A, Seabrook GR, Edmiston CE, Jr. Evaluation of an innovative antimicrobial surgical glove technology to reduce the risk of microbial passage following intraoperative perforation. *Am J Infect Control.* 2011;39(2):98-103.

Mistelli H, Weber WP, Reck S, et al. Surgical glove perforation and the risk of surgical site infection. *Archives of surgery.*2009;144(6):553-558; discussion 558.

Infection Prevention

One of the most astounding aspects of infection prevention and control is the unresolved level of HCW non-compliance



World Health Organization. Global Guidelines for the Prevention of Surgical Site Infection. 2016; <http://www.who.int/gpsc/ssi-guidelines/en/> Accessed 10th November 2016.

observed across several different occupational groups and settings. Non-compliance is observed across a range of recommendations from hand hygiene, use of personal protective equipment and inappropriate wearing of OR attire. This non-compliance has also been observed around glove use among nurses where almost one-fifth of respondents in a 2007 study conducted by Ganczak and Szych on surgical nurses and compliance with personal protective equipment reported not wearing gloves despite having cuts and abrasions.

Ganczak M, Szych Z. Surgical nurses and compliance with personal protective equipment. *J Hosp Infect.* Aug 2007;66(4):346-351.

Initial focus areas for quality improvements should include:

- **acceptance** that gloves are always an adjunct to hand hygiene and not an alternative, also that sterile, surgical gloves are only effective if they are intact;
- **adoption** of routine double-gloving for the complex surgeries including those where glove perforation is most likely and/or surgical site infection is potentially catastrophic;
- **introduction** of routine double glove changing (both top and under glove) at critical stages within every complex surgical procedure;
- **consider** double-gloving for care and procedures where there is any likelihood of glove perforation and subsequent contamination of the environment, the patient, or the healthcare worker; and
- **clarifying** and standardizing guidelines and recommendations to reflect the above practices.

Research has confirmed that when glove integrity is compromised through tearing, splitting or piercing with a sharp object, there is potential for pathogens to transfer bi-directionally between the healthcare worker (HCW) and anything or anybody their hands touch. Glove micro-perforation is not uncommon and in the OR rates from 15% to 24% have been reported depending on the duration of wear. Investigators in that study recommended that gloves be changed routinely every

90 minutes regardless of whether or not a perforation is recognised. Further, for more than a decade we have known that in water-permeability tests leakage is reduced between three-to-nine fold when two pairs of gloves are worn compared to wearing a single pair of gloves. One of the earliest studies of the benefits of double-gloving among surgeons found that in 82% of cases where an outer glove is perforated the inner glove protects the surgeon's hand from contamination.

Partecke LI, Goerdts AM, Langner I, et al. Incidence of microperforation for surgical gloves depends on duration of wear. *Infect Control Hosp Epidemiol.* May 2009;30(5): 409-414.

Thomas S, Agarwal M, Mehta G. Intraoperative glove perforation--single versus double-gloving in protection against skin contamination. *Postgrad Med J.* Jul 2001;77(909):458-460.

Findings on Double-Gloving

Early systematic reviews reported mixed results regarding the protective effect of double-gloving for OR staff. However, the most recent 2014 Cochrane Review, reported that '...in 12 studies, two pairs of gloves reduced the number of perforations in gloves by 71% compared to the use of one pair of gloves. In three studies, two pairs of gloves reduced blood stains on the skin by 65%.' The Cochrane Review also reported further reductions in perforations when three pairs of gloves are worn compared to either wearing a double or single pair of gloves. The use of indicator gloves which enable a coloured spot to show when the user's outer glove is perforated reduced the number of glove perforation in two studies. Overall, the Cochrane Review authors concluded that surgeons and surgical staff wearing two pairs of gloves rather than one reduce their risk of being exposed to and contracting serious viral infection occupationally. They recognise that more work is needed to determine whether the additional protective benefits apply to HCWs outside of the OR.

Some HCWs and particularly surgeons and OR staff are disinclined to wear more than one pair of gloves. They claim that their dexterity and ability to safely handle and use instruments is compromised or in some way diminished with the addition of



an outer pair of gloves. Multiple studies investigating tactility and sensation both objectively and subjectively have concluded that there is no negative impact on tactility associated with use of double gloves. A 2010 study by Fry disputes any negative impact of double-gloving on a surgeon's manual dexterity and tactile sensation. In interviews with 56 surgeons, Fry found no difference in dexterity or sensation when no gloves, one pair or two pairs were worn.

Mylan and colleagues have published important work in which they advocate better understanding of glove use so that design, composition and fit can be maximised. Mylan also recognised differences between perceived and actual glove performance. It is likely that reluctance to wearing an additional pair of gloves is based more on a perception that dexterity and tactile sensation are affected than any actual measurable difference. The extent to which habitual practice and general disregard for infection control measures affect non-compliance with current recommendations for OR staff to routinely double glove should also be considered.

Mischke C, Verbeek JH, Saarto A, Lavoie M, Pahwa M, Ijaz S. Gloves, extra gloves or special types of gloves for preventing percutaneous exposure injuries in healthcare personnel. *Cochrane Database of Systematic Reviews* 2014, Issue 3.

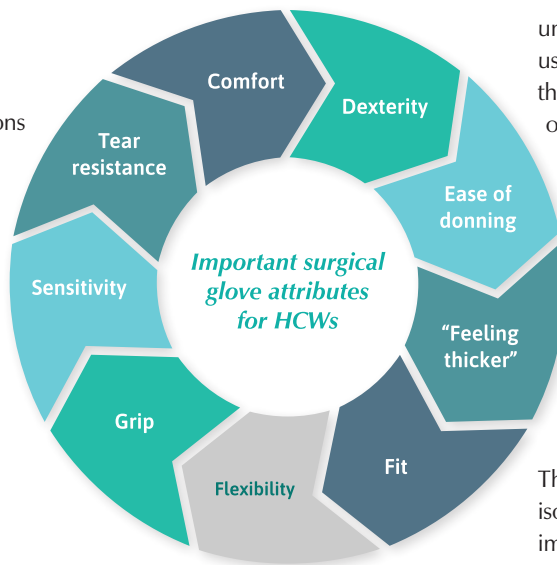
Fry DE, Harris WE, Kohnke EN, Twomey CL. Influence of Double-Gloving on Manual Dexterity and Tactile Sensation of Surgeons. *Journal of the American College of Surgeons.* 3// 2010;210(3):325-330.

Mylan P, Lewis R, Carré MJ, Martin N, Brown S. A study of clinicians' views on medical gloves and their effect on manual performance. *American Journal of Infection Control.* 1// 2014;42(1):48-54.

Understanding the Importance of Compliance

HCW non-compliance with infection prevention and control recommendations can result from lack of understanding, conflict with internal values and beliefs, poor human factors design that make compliance difficult or even ambiguous or conflicting positions included in relevant directives. It is common for guideline recommendations to conflict with evidence especially as research using innovative new or redesigned equipment or product is published. Further, new product may come to market but there may be a substantial lag before the impact of product can be tested in clinical rather than laboratory-based settings in numbers sufficient for scientifically rigorous research. The submission and publication of peer reviewed scientific research is typically also protracted. As a result, clinicians who require evidence before adopting new technologies, formulations, designs or compositions might seem to be perceived as inadvertently delaying local adoption of best practice. Understanding the ongoing inability of guidelines and standards to reflect best available research and appreciating how this often results in conflicting recommendations is important, however, best practice relies on evidence from scientific studies and practice standards. It often explains ambiguity in recommendations and the resultant confusion amongst HCWs as to which practice is best, safest and most effective.

Variations and conflicts in current Australian recommendations regarding double-gloving illustrate this point well and are described in this section.



Making sense of which recommendation to follow at an organisational level is often left up to those with governance responsibility. Good practice should include an appreciation for staying on top of and understanding evolving research, product innovation and always checking the publication date of any directive as well as the currency of research used to underpin its recommendations. Obviously, where conflict exists, the “strength” of the directive, that is its role in terms of a legislative, accreditation or professional requirement, should also be considered.

In the study Dhar and colleagues investigated how HCWs in eleven US hospitals complied with PPE requirements and in particular how increases in the number of patients requiring contact isolation impacted compliance. The researchers studied HCW’s hand hygiene practice, donning of gloves and gowns before room entry and also their practices on leaving the patient’s room.

Perhaps unsurprisingly the results indicated that as the volume of patients requiring isolation increased HCWs’ compliance decreased. Overall observed compliance with gloving was 81%. Three professional groups; medical students, phlebotomists and radiology technicians wore gloves 100% whereas at 75.9% senior medical staff had the lowest rate of glove compliance. There was no significant difference between glove compliance in ICU and non-ICU settings. Investigators noted that HCWs were the least compliant with the requirement to

undertake hand hygiene before glove use. They recognise that even though there is an “8-fold reduction in bacteria” on HCW’s hands as a result of glove use, hand hygiene remains crucial before and after glove use. This observation is therefore of concern.

The overall compliance with all five requirements was only 28.9% and importantly, the study showed that when the proportion of patients requiring isolation exceeded 60%, there was a marked 6-fold reduction in compliance with all five elements. The authors suggest that this may indicate isolation fatigue and they raise the important point that non-compliance even when the isolation frameworks are in place, may inadvertently contribute to disease transmission. The study is a sobering reminder of why education, measurement and frontline healthcare worker involvement in infection prevention and control are crucial to our efforts to achieve sustained compliance improvements.



Conclusion

We have reviewed current practice, research, guideline recommendations and innovations relating to glove use and SSI risk and prevention. This review has highlighted that despite understanding the key role surgical gloves play in SSI prevention, improvements are needed to provide for the safety of patients and clinicians. In the future, we look forward to sharing more information and insights into making healthcare and in particular, surgical care safer for patients and their caregivers.

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References: **1.** Higgins C, Palmer A, Cahill J, Nixon R. Occupational skin disease among Australian healthcare workers: a retrospective analysis from an occupational dermatology clinic, 1993-2014. *Contact Dermatitis*. 2016;75(4):213-22 **2.** Heese A, Hintzenstern JV, Peters K, Koch HU, Hornstein OP. 1991. Allergic and irritant reactions to rubber gloves in medical health services. *Journal of the American Academy of Dermatology*. 25:831-839.



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VITACORE

New Canadian Respirator Excels in Filtration, Breathability, and Fit

Abstract

Vitacore, a local PPE manufacturer out of Burnaby, BC, introduced Canada's first N95 disposable respirator in August of 2020, authorized by Health Canada. Shortly thereafter, Vitacore rolled out the first mask and respirator recycling program within the country. Over a span of six months, Vitacore grew from five to over 100 employees. The CAN99 respirator, which is the newest and most advanced particulate respirator from Vitacore, leverages a unique design and provides the highest level of protection to Canadian healthcare and frontline workers. The CAN99 respirator stands out due to its balance of utility and comfort, while maintaining an industry-leading fit, advanced filtration efficiency, and outstanding breathability. By virtue of its design and fabrication, the CAN99 respirator integrates seamlessly with Vitacore's innovative recycling program. With one of the highest performing respirators on the market and an end-to-end recycling program, Vitacore aims to revolutionize the PPE landscape, paving the way to a greener future.

Specifications

A respirator works primarily through its filtering surface/shell where particles are trapped inside the filter material through which air flows. Besides filter efficiency, the most important factor determining a respirator's effectiveness is fit. The shape of CAN99 respirators is designed to fit a wide variety of face shapes. Moreover, specially formulated headbands and an aluminium nose clip ensures superior fit and durability for the user. Based on real world fit testing results in accordance with CSA Z94.4-18 standard [1], the CAN99 respirator fits more than 90% of the participants in community settings.

The CAN99 respirator is designed and constructed with five layers of protection, achieving filtration efficiency greater than 99%, along with amazing splash resistance. CAN99 respirator is the only N99-level disposable surgical respirator that is approved as a Level 3 surgical respirator in Canada. Typically, increases in filtration efficiency will result in higher breathing resistance.

With the CAN99 respirator, and state-of-the-art air filtration technologies, Vitacore manages to increase filtration efficiency while lowering breathing resistance. Multiple local and international tests showed that the CAN99 respirator has the best breathability among other respirators in the current market.

CAN99 respirators are also designed with safety in mind. The finished product is tested for biocompatibility through cytotoxicity, sensitization and irritation assays. Vitacore ensures that the respirator, along with its constituent materials are biocompatible and does not cause skin irritation or sensitization when donned, ensuring its safety and comfort to the wearer. Furthermore, headband attachments of CAN99 respirator are ultrasonically welded instead of stapled. Ultrasonic welding increases the efficiency of production and prevents perforations which can affect filter efficiency. It also avoids the use of ferrous staples which can affect MRI compatibility.

Vitacore is always committed to developing best production process to ensure both the quality of product and effectiveness of manufacturing. Besides the innovative production process, Vitacore strives to manufacture products with a minimal environmental footprint. The CAN99 respirators are comprised of recyclable materials. Hence, off cuts and used respirators are incorporated into an innovative recycling process which minimizes waste. In conjunction with Vitacore's recycling program, CAN99 respirators improve the sustainability in the PPE industry as the polymers recovered are repurposed for other downstream processes.

Metrics

The quality and effectiveness of CAN99 were inspected and tested by various institutes, including Vancouver Coastal Health, Vancouver General Hospital,



National Personal Protective Technology Laboratory (NPPTL), Nelson Labs, CSA Group, and British Standard Institute (BSI). Many features of CAN99 were analyzed, including biocompatibility, Particulate Filtration Efficiency (PFE), breathability, comfort, Total inward leakage, fit, and mechanical strength of headband attachment. Generally, all testing results showed that CAN99 respirators have the highest performance in the current market.

The biocompatibility of CAN99 respirators, particularly of the materials that come into contact with the skin, such as the innermost layer of the non-woven fabric material and headband, were tested in accordance with the ISO 10993 requirements. All tested raw materials did not induce any significant reactions; thus, CAN99 respirators are determined to be non-cytotoxic, non-sensitizing and non-allergenic. The particle filtration efficiency, or PFE, of a respirator is a direct indicator of the filtration performance of the respirator, which is one of the keys to protecting people's health. Typically, a respirator with a PFE level greater than or equal to 95% is recognized as an N95 equivalent filtering piece, able to provide satisfactory respiratory protection. Twenty Vitacore CAN99 respirators from each batch were randomly selected and tested for filtration efficiency in accordance with NIOSH standard TEB-APR-STP-0058 [6], and all tested CAN99 respirators exhibited filtration efficiency greater than 99%. In order to ensure good breathability, three samples of CAN99 respirator from each batch were randomly selected and tested for inhalation resistance according to NIOSH standard TEB-APT-STP-0007 [4] and exhalation resistance according to NIOSH standard TEB-APR-STP-0003 [5]. All tested samples passed the breathability criteria which require inhalation resistance measurements to be less than 35 mm H₂O column and exhalation resistance to be less than 25 mm H₂O column. Additionally, CAN99 respirators were assessed for fit in accordance with the CSA Z04.4-18 [2] on over 100 participants. The passing rate was over 90%.

The CAN99 respirator has superior performance, which meets the

requirements from both North America and European standards. Based on assessments by the British Standards Institute, CAN99 is classified as an FFP3 NR (filtering facepiece Level 3 non-reusable) respirator, under the EN149 standards. FFP3 is the highest class of protection under the EN149 standards, which allows for use in circumstances with a high risk of pathogen exposure or contamination, such as during bronchoscopy, intubation, or asbestos abatement.

Vitacore sets stringent requirements for quality control and has established its own testing capabilities. The stringent standards ensure that quality control is performed to meet both industry and regulatory requirements. Due to the scale of the operation and the variety of PPE products produced, more than 100 people were hired over the course of the last six months. Vitacore also constantly improves production processes to incorporate automation which further increases accuracy and productivity. Due to the innovations in production processes of the CAN99 respirator, the overall production efficiency of CAN99 is increased by 60% compared to the previous generations of respirators.

Practice Changes

Even though an N99 level respirator may seem to filter particulates at a slightly higher efficiency (99%) compared to an N95 level respirator (95%), it offers a much higher protection level (protective factor of 20 vs 10) than an N95 respirator. This is because harmful particles such as viruses and other pathogens have a much lower chance of penetrating the high-efficiency filter within an N99-level respirator. Within the UK, N99 level respirators are mandated in healthcare settings, whereas the N95 respirator with a lower level of protection is the golden standard in North America. This can be partly attributed to the fact that older N99 level respirators are often much less breathable compared to N95 respirators. Given the state-of-the-art technology used in the manufacturing of melt-blown filters, the CAN99 level respirator introduces a level of comfort and usability that is unmatched, making

it optimal for use in a health care setting. The introduction of Vitacore's CAN99 surgical respirator is intended to change the landscape of respiratory PPE use in North America, promoting the widespread adoption of N99 surgical respirators in healthcare settings. The adoption of N99 level respirators such as the CAN99 will allow health care workers to be much better protected, while maintaining a higher degree of comfort, especially compared to cup-style respirators. In addition to comfort and utility, the newer manufacturing processes enable the CAN99 respirator to be produced more efficiently, at a similar price point to traditional N95 respirators.

Vitacore sources raw materials from sustainable and responsible manufacturers to ensure the safety and reliability of its products. The raw materials used in the fabrication of the CAN99 respirator allow it to be fully recycled within Vitacore's recycling program.

Together with multiple partners and stakeholders, Vitacore aims to drive sustainable use of PPE within the industry. Vitacore has designed and installed recycling bins at multiple public and private institutions. The masks and respirators disposed of at these bins are collected and delivered to Vitacore for treatment and processing. With the increased adoption of sustainable PPE solutions such as the CAN99 respirators, Vitacore aims to lead the way in reducing waste. If all hospitals and public institutions adopt sustainable PPE programs, there will be a significantly positive impact on our environment and economy.

Implementation

The successful implementation of a CAN99 program involves starting with the awareness of respirator storage and use requirements and ending with the enrollment in an end-to-end recycling program. The CAN99 respirators should be stored according their packaging labels in a cool, dry area and away from direct sunlight. Properly stored CAN99 respirators can have a shelf life of five years or more.

Prior to using the respirator, Vitacore recommends the engagement of a qualified fit tester to conduct a quantitative fit test. A quantitative fit test can be used to test any tight-fitting respirator, ensuring that there's a proper seal to protect the user. The test uses

an instrument, e.g., TSI Portacount, to measure leakage around the face seal, resulting in a number called the "fit factor". The higher the fit factor, the lower the leakage measured. A minimum fit factor of 100 is required for the respirator to be deemed as

a suitable fit for the wearer. The CAN99 respirator has been designed for comfort and ease of use, and the donning and doffing procedures are straightforward without much training required. User instructions can be found on the packaging of the respirators, and videos of donning and doffing can be found online at the manufacturer's website.

The full benefits of CAN99's sustainable design can only be realized with enrollment in Vitacore's recycling program. Recycling bins are installed at point-of-use locations, e.g., vaccination centres, various units within hospitals, etc. The CAN99 respirators are deposited into the designated recycling bins after use. The recycling bins are then shipped to the nearest recycling facility where the discarded CAN99 respirators undergo sterilization, material separation and extrusion. The discarded masks are first sterilized using high heat, and shredded, where embedded materials are liberated. The shredded materials are then fed into a specially designed melt-extrusion system resulting in the production of novel polymer blends with high purity and good mechanical characteristics. The pellets are then used in the downstream manufacturing of products ranging from nonwoven fabrics to building materials.

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vitacore.ca info@vitacore.ca 1-888-593-2218 **VITACORE**

Narrative (Post-Implementation)

Approximately 63,000 tons of disposable PPE will be discarded by Canadians in 2021 alone [8]. Based on estimates from environmental bodies, most of these products (90%) will either be discarded in landfills (~86%) or burnt in incinerators (~4%) [9]. It is estimated that as many as 1.5 billion disposed masks could end up in our world's oceans this year [10]. Due to the presence of different materials in masks and respirators, including, but not limited to polyester, aluminum and ferrous metals such as iron, discarded PPE in landfills presents ecological challenges due to the toxic leachates such as lead, antimony, and cadmium [11]. Incineration of PPE presents

other threats to public health such as cancer and respiratory illnesses and threats to the environment such as global warming and acidification [12].

Since the beginning of the pandemic, Vitacore has directly generated over 100 jobs in just over one year, producing masks and respirators to keep our frontline workers and communities safe. All of our products are designed with sustainability in mind, as they are fully recyclable. Our recycling program is initially designed to process excess materials, defective materials, and cut outs during our manufacturing process, resulting in zero waste generation. This maximizes the sustainability of our products and manufacturing processes alike.

Used masks and respirators collected at point of use locations such as hospitals and community centers are sent to a central processing facility where sterilization, material separation and polymer recovery is performed. The resulting pellets comprising of our unique recycled polymer are then used to fabricate a wide variety of products, ranging from building materials to nonwoven textiles.

Vitacore has been collaborating with multiple institutions and has seen its recycling program launched in at least 200 locations around Canada. Vitacore is also working with institutional partners, increasing the versatility of the program to include a wider range of disposal PPE such as gowns, and surgical drapes. Our recycling program alone is projected to create up to 150 additional jobs across Canada and our services have since expanded to accept materials such as surgical drapes, gowns and other PPE besides masks. With our recycling program and the innovative technologies it brings, Vitacore aims to continue as a disruptive force in bringing sustainability and most importantly, Canadian Innovation to the PPE landscape.

Cost of Implementation

The implementation of a CAN99 program is very competitive with other respirators on the market. Due to highly efficient manufacturing processes, Vitacore is able to match the price of its CAN99 respirator with foreign

made respirators of the same class. Furthermore, Vitacore will also be able to provide resources for fit testing, further lowering the cost of implementation.

Contact information

For more information, please do not hesitate to visit us at www.vitacore.ca or write to us at: info@vitacore.ca.

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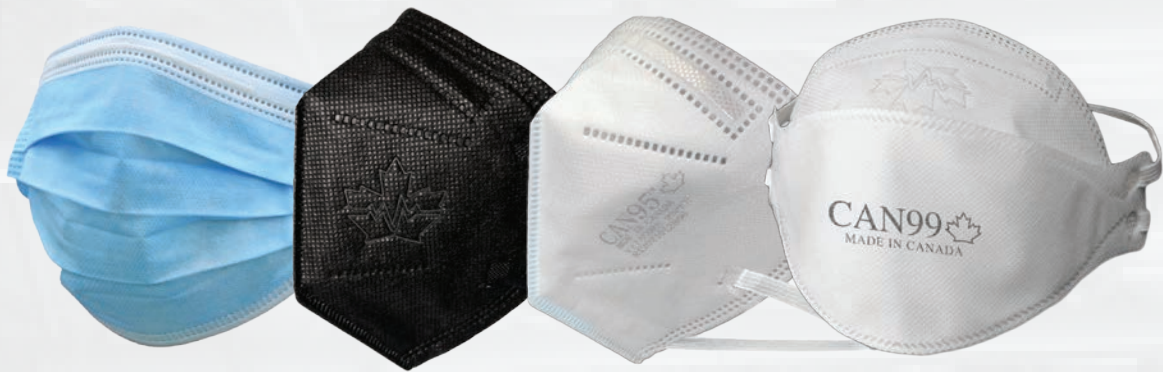


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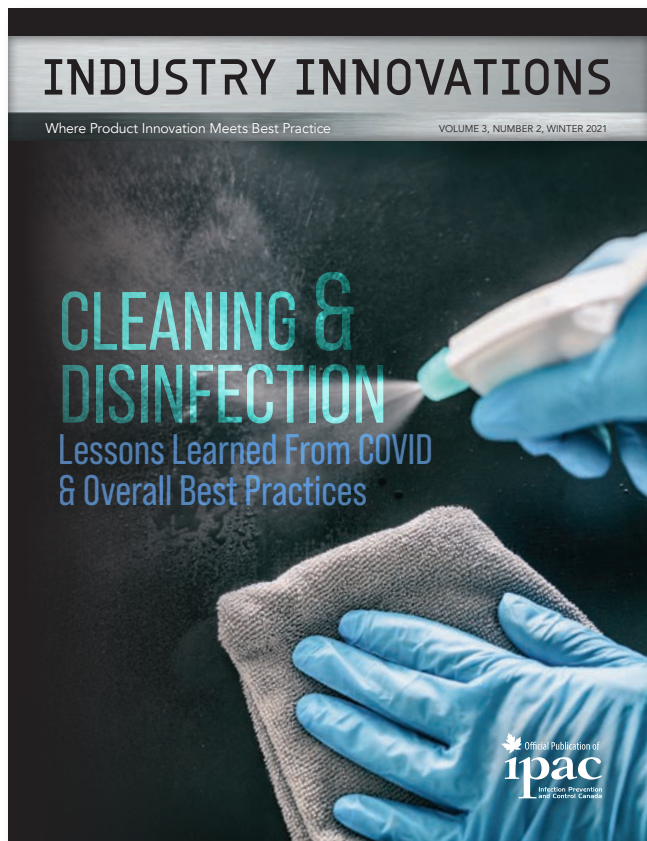
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CLEANING & DISINFECTION

Lessons Learned From COVID & Overall Best Practices

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INDUSTRY INNOVATIONS

Industry Innovations for Winter 2021 will showcase innovative product offerings and practice recommendations supporting cleaning and disinfection for infection prevention and control in health care.

The past year has been filled with extraordinary circumstances as a result of the battle against COVID-19 and Environmental Services (EVS) professionals have been on the frontline all along. Securing the required cleaning and disinfecting supplies has been one of the main challenges faced by EVS, while trying to keep surfaces clean and disinfected for everyone's safety. The industry as a whole faced many new challenges which were brought upon by supply shortages, the need to adapt to changes in the supply chain and staffing shortages, while providing extensive training to EVS personnel based on the latest disinfection protocols that allow us to protect patients, fellow healthcare workers and ourselves.

Our healthcare system relies on keeping surfaces sanitized as one of the key elements in breaking the chain of transmission of infectious agents. The future will most certainly bring forward new and emerging infections and EVS professionals are gearing up to ensure that we are ready to face these battles. New disinfection technologies and many parallel innovations will help make the difference for this evolving industry. With this in mind, industry partners are

being called upon to showcase equipment and technology which will make a difference in our quest to stop the spread of infection through environmental surfaces.

GUIDELINES

The role of the Editor and Guest Editors, Industry Innovations, is to ensure this publication is a high quality, structured, and comparative resource for Infection Prevention and Control Canada's (IPAC Canada) core membership. All submissions to Industry Innovations are subject to curatorial review. Relevance to IPAC Canada membership and integrity of claims will be assessed prior to approval or denial of publication partnership. For whitepapers accepted for publication, the editor and publisher will coordinate with the submitting industry partner prior to publication with applicable technical editing requests. The editor and publisher will also ensure that the curation and publishing process of whitepapers and advertisements accepted for publication are managed transparently in consultation with authoring industry partners.

Preferred whitepapers for publication in Industry Innovations will refrain from subjective and unverifiable claims. They will use a mixture of industry voice, technical specification, and use-case logistics with significant attention to the immediate organizational impact of implementation. The numbered guideline sections below are sequentially ordered



to provide a comparable reading flow throughout Industry Innovations volumes and must be adhered to during whitepaper development. The suggested word count is included for the whitepaper author's reference to ensure sufficient content is incorporated into each section without exceeding the suggested submission length of 4500 words.

GENERAL GUIDELINES:

- Core Focus: Industry Innovations' guidelines are structured to provide a comparable summary of considerations to enable IPAC Canada readership to assess their organization's implementation readiness and the immediate use cases of an industry product
- Please refrain from comparing your product's solution to competing solutions
- Where clinical or industry research is referenced; ensure summary description of the research is included rather than generalizations

For in-text citations, use parenthetical numbers (Vancouver style) and append references to end of whitepaper using the same order of numbers appearing in-text

1. Abstract – ~500 Words:

- What makes this product stand out as an innovative contribution or solution to issues of cleaning and disinfection in healthcare settings?
 - Please refrain from comparative analysis to other innovations regarding cleaning and disinfection, but common standardized processes may be referenced.

2. Specifications – ~600 Words:

- Describe the technology/engineering design of the cleaning and disinfection equipment innovation.
- If there are electronic components, please describe their utility (sensor, tracking, cleaning, connectivity, etc).
- Describe any additional resources used peripherally to your product innovation if applicable and what ongoing resources a healthcare facility implementing your solution will need to have in place to support the cleaning and disinfection innovation you describe (e.g., storage/wall space, embedded into infrastructure, etc.).

3. Metrics – ~600 Words:

- Describe any recommended statistical tracking methodology for cleaning and disinfection, as applicable (e.g., reduction of HAIs, impact on department cleaning and disinfection measurement audits, ATP audits, hand hygiene compliance)
- Previous quantitative research in effectiveness of the innovation may be described and referenced here.

4. Practice Changes – ~600 Words:

- Please describe the frontline practice changes involved in implementing your company's solution.
 - For example, will your solution add additional steps to the cleaning and disinfection process? Will it affect care of the patient? Will there need to be accommodations for additional laundering or disposal of single use products? Will Environmental Services staff and Clinical Health Care providers need to be trained to use your new product or innovation?

5. Implementation – ~600 Words:

- Please describe the steps involved in implementation of your cleaning and disinfection innovation. What stakeholders are needed (Infection Control, Occupational Health, Health Educator, Environmental Services, Facilities/Maintenance, etc...)?
- What activities involved in initial implementation/ ongoing maintenance of this innovation will be managed by your company?
- What initial/ongoing maintenance steps will be managed by the healthcare facility hosting your cleaning and disinfection solution?
- What maintenance steps are required to ensure the cleaning and disinfection innovation is operating effectively on a continuous basis?

6. Narrative – ~700 words:

- Please provide in narrative format the post-implementation use-case of the cleaning and disinfection innovation product by healthcare staff and any new processes involved with use of the product.
 - Please include information on contact times, dilution requirements, health and safety measures, additional training; focus on tasks performed by healthcare institution staff involving the immediate use of your product

7. Cost Estimate - ~300 words:

- Please provide a cost estimate in table format for implementation of your cleaning and disinfection solution given typical needs in a small/medium/large healthcare setting

8. Contact Info

- Please provide detailed contact info (phone, email, webpage, etc.) to ensure interested readers are able to reach out for further information and estimates.

PERSONAL PROTECTIVE EQUIPMENT

INFECTION PREVENTION AND CONTROL AUDIT for Use of Personal Protective Equipment (PPE)

©With permission of Infection Prevention and Control Canada, August 2021

Name of Facility _____ Ward/Unit _____

Date: YYYY _____ MM _____ DD _____

Time: _____ hours / _____ AM _____ PM Manager: _____

Auditor (print): _____ Signature: _____

NOTES:

1. For instructions on doffing (removing) PPE, please refer to Appendix A and to website link at: <https://ipac-canada.org/tools.php>;
2. This audit tool is not a guide to equipment choice or purchase.

TYPE OF HEALTHCARE WORKER

(suggested categories):

- 1 = Physician
- 2 = Nurse
- 3 = Social Worker
- 4 = Physiotherapist
- 5 = Occupational Therapist
- 6 = Housekeeping
- 7 = Respiratory Therapist

TYPE OF PRECAUTIONS:

- RP = Routine Practices
- A = Airborne Precautions
- C = Contact Precautions
- D = Droplet Precautions
- DC = Droplet + Contact Precautions
- AC = Airborne + Contact Precautions

ABBREVIATIONS:

- AP Additional Precautions
- HCW Healthcare Worker
- N No
- N/A Not Applicable
- PPE Personal Protective Equipment
- RP Routine Practices
- Y Yes

(PPE)

GLOSSARY:

Additional Precautions (AP): The precautions (i.e., Contact Precautions, Droplet Precautions, Airborne Precautions) that are necessary in addition to Routine Practices for certain pathogens or clinical presentations. These precautions are based on the method of transmission (e.g., contact, droplet, airborne).

Airborne Infection Isolation Room (AIR): (a.k.a., a negative pressure room). A room designed, constructed, and ventilated to limit the spread of airborne micro-organisms from an infected occupant to the surrounding areas of the HCF. Used for patient requiring airborne precautions, e.g., patients with known or suspected pulmonary tuberculosis, varicella-zoster, measles.

Airborne Precautions: Precautions that are used in addition to Routine Practices for clients/patients/residents known or suspected of having an illness transmitted by the airborne route (i.e., by small droplet nuclei that remain suspended in the air and may be inhaled by others).

Contact Precautions: Precautions that are used in addition to Routine Practices to reduce the risk of transmitting infectious agents via contact with an infectious person and/or the environment.

Droplet Precautions: Precautions that are used in addition to Routine Practices for clients/patients/residents known or suspected of having an infection that can be transmitted by large infectious droplets.

Droplet-Contact Precautions: A combination of Droplet and Contact precautions that are used in addition to Routine Practices for clients/patients/residents known or suspected of having an infection that can be transmitted by large infectious droplets AND via contact with an infectious person and/or the environment.

Fit-Test: A qualitative or quantitative method to evaluate the fit of a specific make, model and size of respirator on an individual, according to regulatory standards (e.g., Canadian Standards Association standards, provincial ministries of labour). Fit-testing is to be done periodically, at least every two years and whenever there is a change in respirator face piece or the user's physical condition which could affect the respirator fit.

Hand Hygiene: A general term referring to any action of hand cleaning. Hand hygiene relates to the removal of visible soil and removal or killing of transient microorganisms from the hands. Hand hygiene may be accomplished using

soap and running water or an alcohol-based hand rub. Hand hygiene includes surgical hand antisepsis.

N95 Respirator: A personal protective device that is worn on the face and covers the nose and mouth to reduce the wearer's risk of inhaling airborne particles. A NIOSH-certified N95 respirator filters particles one micron in size, has 95% filter efficiency and provides a tight facial seal with less than 10% leak.

Personal Protective Equipment (PPE): Clothing or equipment worn by staff for protection against hazards, when worn correctly, e.g., masks, respirators, gowns, gloves, visor.

Routine Practices (RP): The system of infection prevention and control practices recommended by the Public Health Agency of Canada to be used with all clients/patients/residents during all care to prevent and control transmission of microorganisms in all healthcare settings.

Seal-Check: A procedure that the healthcare provider must perform each time an N95 respirator is worn to ensure it fits the wearer's face correctly to provide adequate respiratory protection. The healthcare provider is to receive training on how to perform a seal-check correctly.

		Healthcare Worker							
Bed/Bed Space Location or Number ▶									
Type of Precautions (see list of types p.18) ▶									
Type of Healthcare Worker (see list of types p.18) ▶									
Element/Item to be Monitored: ▼		Compliance (Y, N, N/A): ▼							
1.0 Policies, Protocols, Infrastructure									
1.1	Personal protective equipment (PPE) supplies are readily available and accessible in a variety of sizes, from appropriate dispensers/donning stations.								
1.2	Alcohol-based hand rub (ABHR) and/or hand hygiene sink (HHS) is available at donning and doffing locations.								
1.3	Appropriate bins (lidded, foot operated) are available for used PPE, at doffing locations.								
1.4	Used PPE bins (single use items, e.g., nitrile gloves and reprocessed items, e.g., gowns) are not over-filled.								
1.5	Policies and protocols for donning and doffing PPE are available.								
1.6	An instructional video demonstrating donning and doffing of PPE is available.								
1.7	Documented evidence available to show staff have received appropriate training and have demonstrated competency donning and doffing PPE.								
1.8	There are appropriate posters affixed to patient room doors, detailing the required PPE, prior to entering. The poster should contain pictures/icons to allow easy understanding.								
1.9	Fit Test Reports for all applicable healthcare staff, dated within two years, are available for inspection. The report shall contain name, test date, due date, respirator details (manufacturer, model, style, size) pass level, efficiency, and signature of fit test operator.								

2.0 Donning (putting on) PPE									
2.1	The correct PPE is selected based on a Point-of-Care Risk Assessment.								
2.2	The correct sequence for donning PPE, including Hand Hygiene steps, are followed.								
2.3	Hand Hygiene is performed correctly.								
2.4	Gown is appropriate size and secured correctly.								
2.5	Mask is placed over mouth, nose, and chin. The flexible nose bridge, is adjusted, and mask is secured on head and leak tested.								
2.6	Respirator is placed over mouth, nose, and chin. The flexible nose bridge is adjusted and mask is secured on head and leak tested.								
2.7	Eye protection positioned correctly and secured.								
2.8	Gloves are single use, fit well, and extend over cuffs of gown.								

3.0 Doffing (taking off) PPE										
3.1	The correct sequence for doffing PPE, including Hand Hygiene steps are followed.									
3.2	PPE is doffed in a manner that avoids self-contamination and contamination of environment.									
3.3	All PPE, except mask, is doffed in patient's room, at the door, or in the anteroom.									
3.4	Eye protection (goggles, visor) are removed using only the side-arms or strap.									
3.5	Masks/respirators are removed, using only the straps, outside of the patient's room.									

4.0 Safe Use of PPE										
4.1	PPE is not adjusted once healthcare staff enters the patient's room.									
4.2	If gloves become torn or damaged, they are removed immediately, hand hygiene is performed, and new gloves are donned.									
4.3	Reusable goggles/visors are cleaned with a single-use disinfection wipe after use.									

Compliance Score										
Total number of 'Yes'										
Total number of 'No'										
Total number of items ('Yes' and 'No', exclude 'N/A')										
Compliance Score (see below for calculation):										
Scoring: $\frac{\text{Total number of 'Yes'}}{\text{Total Number of 'Yes' and 'No'}} \times 100 = \% \text{ compliance (compliance score)}$										

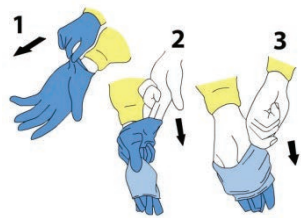




Feedback on Compliance:
 There must be a process in place to address audit deficiencies, and to improve timely feedback, on a priority basis (e.g., safety issues would be addressed immediately.)

Additional Comments:

DISCLAIMER:
 These audit tools are based on infection prevention and control best practices current at the time of publication. The individual elements provided in these tools are not intended to take the place of either the written law or regulations.

Donning PPE properly and ensuring it is worn according to best practices is very important. It is also essential that PPE is removed in a way that avoids potential self-contamination. “Annex A: Taking off PPE” has been taken from the IPAC Canada Personal Protective Equipment (PPE) audit tool (p.7) and provides direction on how to properly remove PPE.

APPENDIX A

Taking off Gloves	
Grasp outside edge of gloves near the wrist	
Peel gloves away from the hand and turn inside-out	
Hold first glove in the opposite gloved hand	
Slide ungloved finger under the wrist of the remaining glove	
Peel glove off from the inside, creating a bag for both gloves	
Discard gloves	
Taking off Gown	
Unfasten ties first	
Peel gown away from the neck and shoulder	
Turn contaminated side of gown inward	
Roll gown off the arms into a bundle	
Discard gown in a manner that minimizes air disturbance into a designated receptacle for laundering or disposal	
Perform hand hygiene on removal of gown, using soap and water or ABHR	
Taking off Eye Protection (if not attached to mask)	
Grasp ear or head pieces are grasped with ungloved hands	
Lift eye protection away from face	
Place eye protection in a designated receptacle for reprocessing or disposal	
Prescription eyeglasses are not effective eye protection	
Taking off Mask (with or without attached eye protection)	
Remove mask by untying the bottom tie and then top tie, or removing ear loops	
Lift mask away from the face while holding the ties or loops	
Discard mask into waste receptacle	
Perform hand hygiene , using soap and water or ABHR	
Taking off Mask (with or without attached eye protection)	
Grasp bottom elastic band and lift over the head	
Grasp top band and lift the respirator away from the face while holding the elastic band (do not touch front of respirator)	
Discard respirator into waste receptacle	
Perform hand hygiene , using soap and water or ABHR	

Images courtesy of Public Health Ontario

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ADDITIONAL PROVINCIAL RESOURCES:

Best Practices and Guidelines developed by provinces have also been used as resources for this audit tool. These may be found at: <https://ipac-canada.org/non-acute-care-resources-2.php>.

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