VOLUME 35
NUMBER 1

SPRING 2020

CJIC

The Canadian Journal of Infection Control
Revue canadienne de prévention des infections

Official Publication of
ipac Infection Prevention and Control Canada
pci Prévention et contrôle des infections Canada
ISSN - 1183 - 5702

INSIDE

PM# 40065075 Return undeliverable Canadian addresses to lauren@kelman.ca

We Are Ready.

Engineering Revolutionary Disinfectants for the War Against Microbes

Innovation | Formulation | Validation | Education

virox.com

VIROX TECHNOLOGIES INC.

CREATORS OF ACCELERATED HYDROGEN PEROXIDE Patented

Thank you to all the health care professionals helping combat COVID-19

Clean & Safe Every Time

Vernacare's complete system remains the world leader in delivering environmentally responsible, energy efficient and safe solutions for human waste management.

Benefits of the Award-Winning Vernacare System:

- Environmentally friendly fibre utensils made from 100% recycled newsprint fused together with a natural wax
- Reliable ISO 14001 certified manufacturing with a quality support network
- Biodegradable products for safe and convenient disposal
- Maceratable patient wipes and a full line of accessories
- **SmartFlow**™ technology uses less water and energy
- Industry leading macerator systems backed by a team of highly trained technical support specialists

For more information:
1-800-268-2422 • www.vernacare.com

Vernacare

What's your outbreak protocol?

Communicable diseases cause a significant burden on society in terms of healthcare expenditure and health impact on individuals.[1] A Canadian analysis suggests that hospital outbreaks of influenza occur on a regular basis and contribute to overall morbidity and mortality.[2]

Additionally, healthcare-associated infections (HAIs) affect 4% to 10% of patients and can result in significant harm to patients and healthcare workers.[3,4] Healthcare facilities are complex environments where the provision of care to large numbers of patients can result in the contamination of surfaces and equipment with harmful microorganisms.[5]

Outbreaks are costly.

The costs associated with outbreaks can be considerable and often include:[6]

- Costs associated with utilizing additional staff (such as nurses, healthcare workers, environmental services staff, etc.);
- Microbiological testing;
- Ward and bed closures;
- Loss of revenue from private room accommodation;
- Increased use of supplies (including personal protective equipment);
- Increased use of medications, including preventative vaccinations.

Outbreaks happen.

The ongoing novel coronavirus disease (COVID-19; formerly known as 2019-nCoV) outbreak originating in China, but now spreading worldwide, including Canada, serves as a timely reminder of the importance of adhering to strict infection prevention protocols for outbreak situations, especially at healthcare facilities.

Plan to prevent.

According to the 2020 report *Best Practices for Prevention, Surveillance and Infection Control Management of Novel Respiratory Infections in All Health Care Settings*, by the Provincial Disease Advisory Committee (PIDAC), there are a number of factors that can influence outbreaks, including:[7]

- Adherence to infection prevention and control (IPAC) protocols;
- Hand hygiene, including the use of alcohol-based hand rub and hand washing;
- Assessment of the risk of infection transmission and the appropriate use of personal protective equipment, including correct selection, safe application, removal and disposal;
- Healthcare providers should be apprehensive when screening anyone with a new onset of antimicrobial-resistant infection symptoms or other symptoms characteristic of a novel infection;
- Anyone accompanying a patient who is entering a healthcare setting should also be screened;
- Appropriate cleaning and/or disinfection of healthcare equipment, supplies and surfaces or items in the healthcare environment;
- The use of Health Canada-approved disinfectants;
- Individual staff are responsible for keeping patients, healthcare workers and themselves and coworkers safe. This is in addition to employer and supervisor responsibilities for worker safety.

Be healthcare clean.

"Healthcare clean" is an approach to cleaning that aims to reduce or eliminate microbial contamination of all surfaces and equipment within the healthcare environment.[8]

In a 2018 report, PIDAC recommended that enhanced cleaning and disinfection are often required during outbreaks when environmental contamination and subsequent transmission is known to be related to the organism suspected of causing the outbreak (e.g., norovirus, *Clostridium difficile*).[5] There are multiple studies demonstrating how outbreaks caused by antibiotic-resistant organisms were controlled or stopped following the adoption of enhanced cleaning and disinfection approaches.[9,10]

In an effort to keep up, the technology used to perform environmental cleaning continues to evolve. No-touch disinfection systems use chemical disinfectants or physical agents to disinfect surfaces and can supplement, but not replace, manual cleaning and disinfection.[5]

CloroxPro™ can help.

Our infection control specialists are equipped to review your current outbreak protocols, recommend products based on clinical evidence and customize your protocols to the needs of your facility.

References: 1. Diener A & Dugas J. Inequality-related economic burden of communicable diseases in Canada. *Can Commun Dis Rep Suppl* 2016;42:S1-S7. **2.** Murti M, *et al.* Influenza outbreaks in Ontario hospitals, 2012-2016. *Can Commun Dis Rep Suppl* 2018;44(9):201-5. **3.** Magill SS, *et al.* Multistate point-prevalence survey of health care-associated infections. *N Engl J Med* 2014;370(13):1198-208. **4.** Taylor G, *et al.* Assessing the magnitude and trends in hospital acquired infections in Canadian hospitals through sequential point prevalence surveys. *Antimicrob Resist Infect Control* 2016;5(19). **5.** Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infectious Diseases Advisory Committee. Best practices for environmental cleaning for prevention and control of infections in all health care settings. 3rd ed. Toronto, ON: Queen's Printer for Ontario; 2018. **6.** Dik J-H H, *et al.* (2016) Cost-analysis of seven nosocomial outbreaks in an academic hospital. *PLoS ONE* 11(2):e0149226. https://doi.org/10.1371/journal.pone.0149226. **7.** Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infectious Diseases Advisory Committee. Best practices for prevention, surveillance and infection control management of novel respiratory infections in all health care settings. 1st revision. Toronto, ON: Queen's Printer for Ontario; 2020. **8.** Gauthier J. "Hospital clean" versus "construction clean" – is there a difference? *Can J Infect Control* 2004;19(3):150-2. **9.** Delgado Naranjo J, *et al.* Control of a clonal outbreak of multidrug-resistant *Acinetobacter baumannii* in a hospital of the Basque country after the introduction of environmental cleaning led by the systematic sampling from environmental objects. *Interdiscip Perspect Infect Dis* 2013;2013:582831. **10.** de Lassence A, *et al.* Control and outcome of a large outbreak of colonization and infection with glycopeptide-intermediate *Staphylococcus aureus* in an intensive care unit. *Clin Infect Dis* 2006;42(2):170-8.

CLOROXPRO™

Learn more, or request a product demo at
CloroxHealthcare.ca | healthcare@clorox.com

Protection you can't see.

Everyday sporicidal protection now available for the Clorox Total 360® system.

In addition to our current line of disinfection formulations and products, CloroxPro™ offers a new Spore Defense™ formulation, exclusively for the Clorox Total 360® system. This powerful new chemistry is Health Canada-approved to kill:

- *C. difficile* in **5 minutes**
- **42 out of 47** pathogens in just 1 minute, including MRSA, VRE, measles & polio

Clorox Total 360® system with Spore Defense™, when used regularly, provides your facility with invisible yet effective outbreak prevention.

CloroxPro.ca | healthcare@clorox.com

CLOROX TOTAL 360

The Invisible Guardian

TOMI™ | STERAMIST® HEALTHCARE

FIND OUT HOW **STERAMIST®** DISINFECTION CAN PREPARE YOUR FACILITY FOR THE NEXT THREAT.

Whether you require remote whole-room disinfection or powerful handheld precision, **SteraMist®** offers a variety of **no-touch disinfection solutions** to suit the unique needs of your healthcare facility. Gain a valuable technology to aid in the fight against emerging and existing microbial threats.

iONIZED HYDROGEN PEROXIDE (iHP™) FEATURES A 7.8% HYDROGEN PEROXIDE SOLE ACTIVE INGREDIENT

CONTAINS **NO** BLEACH, CHLORINE, OR SILVER IONS

EASY TO INTEGRATE INTO EXISTING PROTOCOLS

EPA REGISTERED
EPA Reg. #90150-2

HEALTH CANADA **APPROVED**
DIN No. 02469448

PREPARE YOUR FACILITY WITH **STERAMIST®** DISINFECTION TODAY

TOMIMIST.COM
800.525.1698

Achieve the floor-to-ceiling infection prevention that patients expect

FOR DAILY DISINFECTION

Accel® Wipes deliver one-step cleaning and disinfection with a choice of dwell times. Pre-wetted wipes, concentrate, and RTU options for responsible cleaning.

Effective against key pathogens, including MRSA, VRE, TB, and Norovirus. Compatible with most hard, non-porous surfaces

FOR ADDED ASSURANCE

MoonBeam™3 destroys pathogens that cause HAIs in as little as 3 minutes. Individually adjustable light arms deliver a powerful UV-C light dose to disinfect high-touch surfaces.

MoonBeam3 is portable and affordable. Fast, targeted dosing reduces operation costs.

FOR SPECIALTY DISINFECTION

Titan™ Tabs Sporicidal Disinfectant kills *C. diff* spores in just 4 minutes. Shown to kill 99.9999% of *pseudomonas aeruginosa* and *staphylococcus aureus* in biofilms on hard, non-porous surfaces.

Non-bleach formula in compact, easy-to-handle tablets.

SOLUTIONS DESIGNED FOR HEALTHCARE™

See all the infection prevention solutions at **sdfhc.com**

Prescient^{x}

THE WORLD'S 1ST FULLY AUTONOMOUS FIXED AUTOUV DISINFECTOR!

Bathrooms
Equipment Rooms
Utility Rooms
Processing Areas

24/7 AUTONOMOUS DISINFECTION

manufactured in Canada by SANUVOX

ASEPT.1X MAX

Helps to reduce HAIs by eliminating pathogens such as C. Diff and VRE.

519-804-9030
888-885-9030

info@prescientx.com
www.prescientx.com

Proud to be a founding member
CHAIR
Coalition for Healthcare Acquired Infection Reduction

Fast + Effective

A Fast and Effective Equipment Washer...

Medco Equipment, Inc.'s multipurpose portable equipment washer provides dramatic bacteria reduction. Independent lab tests have documented an impressive 99.9% reduction in bacteria ***after one wash***! This machine washes and sanitizes two wheelchairs in five minutes. It also cleans commode chairs, shower chairs, walkers, carts, window screens etc. **2,000 customers worldwide are now sanitizing more than 3.4 million wheelchairs yearly!** Free 30 day trial and delivery. Rent, lease-purchase or purchase. It's a portable dishwasher for wheelchairs and equipment! All stainless steel. CE.UL and CUL listed, 5 year wall to wall warranty. Seven day delivery.

Medco® EQUIPMENT

For more information call (800) 717-3626 or visit
www.medcoequipment.com

Avoid Cross Contamination.

Single patient products that improve patient experience and promote a safe environment by containing body fluids at point of care.

An effective method for avoiding environmental contamination and decreasing the risk of spreading microorganisms such as *C.difficile*.

hygie.com

Isolation Kits

hygie®

Together, let's protect lives

WE TACKLE THE GERMS, SO YOU CAN FOCUS ON WHAT'S AT HAND

The PURELL SOLUTION™
Choose Canada's #1 brand of hand sanitizer[1] along with new innovative dispensing and hand soap solutions to help prevent the spread of germs in your facility.

Request a product demo by emailing GoCanada@GOJO.com

[1]Nielsen Sales 52wk ending 1/4/20.

STEVENS

Inspired by the care you deliver

Your dedicated Infection Control Partner

Canada's largest family-owned medical supplies and equipment distributor

190 STEVENS EST. 1830 1830 2020

3M aegis Diversey GOJO Coloplast CLEANPatch MEIKO Metrex Mölnlycke POG WIPAK clinell

Patch It

A clinically-validated solution for restoring damaged mattresses to an intact and hygienic state.

CLEANPatch

stevens.ca/qr-ipac20-1

Disinfect It

Sustainable cleaning, sanitation, and hygiene solutions to help keep your practice, and the world, in good health.

Diversey™

stevens.ca/qr-ipac20-2

Protect It

Aegis Microbe Shield provides continuous protection between disinfection. The perfect addition to your current protocol.

aegis

stevens.ca/qr-ipac20-3

Contact Stevens today for a Customized Consultation

www.stevens.ca

Eastern Canada	Québec	Ontario	Manitoba	Midwestern Canada	Western Canada
1-800-565-0765	1-855-660-7750	1-800-268-0184	1-800-665-0368	1-800-665-0368	1-800-565-8444
ACCS@stevens.ca	QCSAC@stevens.ca	ONCS@stevens.ca	MBCS@stevens.ca	MBCS@stevens.ca	BCCS@stevens.ca

ID# 1581333559

TD200®

TEE PROBE DISINFECTOR

Disinfect TEE Probes in 3 Minutes!

- **Protects Patients and Staff**
- **Eliminates Over-Soaking**
- **Paracetic acid based HLD**
- **No MRC testing necessary**
- **Printed Verification**
- **Repeatable, verified disinfection cycle**
- **Electrical Leak Test in Machine**

The TD 200 and TD-12 system when used according to the manufacturer's directions is effective against high-risk HPV16 and HPV18.

PHOENIX AIRMID biomedical

1166 South Service Rd. W
Oakville, Ontario
Canada L6L 5T7

Phone: 905-469-4253
www.phoenixairmid.com
info@phoenixairmid.com

EDITOR
Victoria Williams, BSc, BASc, MPH, CIC
Infection Prevention and Control Coordinator
Sunnybrook Health Sciences Centre
2075 Bayview Ave., Toronto, ON M4N 3M5
Tel: 416-480-6100 x 7970 Fax: 416-480-6845
editor-in-chief@ipac-canada.org

ASSOCIATE EDITOR
Devon Metcalf, MSc, PhD, CIC
Infection Prevention and Control Specialist
Public Health Ontario
350 Conestoga Blvd., Unit B4B, Cambridge, ON N1R 7L7
Tel: 226-314-2127 Fax: 519-624-6212
associate-editor@ipac-canada.org

POSTING EMPLOYMENT OPPORTUNITIES/OTHER INFORMATION
IPAC Canada Membership Services Office
info@ipac-canada.org

PUBLISHER
Craig Kelman & Associates

3rd Floor, 2020 Portage Avenue, Winnipeg, MB R3J 0K4
Tel: (204) 985-9780 Fax: (204) 985-9795
www.kelman.ca E-mail: info@kelman.ca

EDITOR - Reba R. Lewis
DESIGN/PRODUCTION - Kiersten Drysdale
MARKETING MANAGER - Al Whalen
ADVERTISING COORDINATOR - Stefanie Hagidiakow

Send change of address to:
IPAC Canada
P.O. Box 46125, RPO Westdale,
Winnipeg, MB R3R 3S3
info@ipac-canada.org

Publications Mail Agreement #**40065075**
Return undeliverable Canadian addresses to: lauren@kelman.ca

SUBSCRIPTIONS
Subscriptions are available from the publisher at the following rates: All Canadian prices include GST.
Prices are listed as personal/institutional.
Canada: $30/$38 (GST # 100761253); USA (in US funds): $28/$36; Other countries: $45/$60.

Subscriptions do not include online access to the journal. Members have online access to the current issue.

VISION
No preventable infections for Canadians. Ever.

MISSION
We inspire, nurture and advance a culture committed to infection prevention and control.

IPAC CANADA is now on YOUTUBE, FACEBOOK, TWITTER and LINKED IN

SPRING 2020

VOLUME 35
NUMBER 1

CJIC
The Canadian Journal of Infection Control
Revue canadienne de prévention des infections

FEATURES

The *Canadian Journal of Infection Control* is the official publication of Infection Prevention and Control Canada (IPAC Canada). The Journal is published four times a year by Craig Kelman & Associates, Ltd. and is printed in Canada on recycled paper. Circulation: 3,000.

ISSN 1183-5702

Indexed/abstracted by the Cumulative Index to Nursing and Allied Health Literature (CINAHL)/EBSCO, SilverPlatter Information, Inc. and CrossRef.

The *Canadian Journal of Infection Control* is a Canadian periodical as defined by section 19 of the Canadian Income Tax Act. The deduction of advertising costs for advertising in this periodical is therefore not restricted.

www.ipac-canada.org

IPAC CANADA
2019 - 2020 Board of Directors

Executive Officers

President
Barbara Catt, RN, BScN, MEd, CIC
Manager IPAC Response and Support
Public Health Ontario
480 University Ave, Ste. 300
Toronto, ON M5G 1V2

President-elect
Zahir Hirji, BScN, MHS, CIC,
Manager, Risk Management/Patient Safety
Scarborough and Rouge Hospital
2867 Ellesmere Road
Scarborough, ON M1E 4B9

Past President
Molly Blake, BN, MHS, GNC(C), CIC
Infection Control Professional
Winnipeg Regional Health Authority
232A North Pavilion, 2109 Portage Avenue
Winnipeg, MB R3J 0L3

Secretary
Jennifer Happe, BSc, MSc
Infection Control Professional
Alberta Health Services
3942 50 A Avenue, Red Deer, AB T4N 6R2

Treasurer
Michael Rotstein, RN, BScN, MHSc, CIC, CHE
Client Services Director
Closing the Gap Healthcare
2810 Matheson Blvd E, Ste 100
Mississauga ON L4W 4X7

Directors

Kim Allain, BScN, RN, MHS, CIC
Quality Improvement and IPAC Safety Lead
Nova Scotia Health Authority
902 Bethune Bldg, 1276 South Park Street
Halifax, NS B3H 2Y9

Madeleine Ashcroft, RN, BScN, MHS, CIC
Infection Control Specialist
Public Health Ontario
300-480 University Avenue
Toronto, ON M5G 1V2

Joseph Kim, MD, FRCPC
Infectious Disease Consultant
Alberta Health Services
7007 14 Street SW
Calgary, AB T2V 1P9

Ramona Rodrigues, RN, BSc, MSc(A), CIC, ICS-PCI, FAPIC
McGill University Health Centre
Montréal General Hospital
1650 Cedar Avenue
Montréal, QC H3G 1A4

Baljinder Sidhu, RN, BScN, CIC, MPH
IP Specialist, Sterile Processing Practices/
Auditing Provincial
Health Services Authority of BC
4500 Oak Street
Vancouver, BC V6N 3N1

Public Representative
Stephen Palmer
79 Amberview Drive
Keswick, ON L4P 3Y3

Other Positions

Editor-in-Chief – Canadian Journal of Infection Control
Victoria Williams, BSc, BASc, MPH, CIC
Infection Prevention and Control
Epidemiologist/Coordinator
Sunnybrook Health Sciences Centre
2075 Bayview Avenue, Toronto, ON M4N 3M5

Associate Editor
Devon Metcalf, MSc, PhD, CIC
Infection Prevention and Control Specialist
Public Health Ontario
350 Conestoga Blvd., Unit B4B,
Cambridge, ON N1R 7L7

Web Communications Manager
Tanya Denich, MSc, CIC

Webmaster
Pamela Chalmers

Online Novice IP&C Course Coordinators
Heather Candon, BSc, MSc, CIC
Jane Van Toen, MLT, BSc, CIC

Social Media Manager
Kelsey Houston BScH MPH

Professional Agents

Legal Counsel
Terrance Carter/Theresa Man
Carters Professional Corporation
211 Broadway, Orangeville, ON L9W 1K4

Auditor
Philip Romaniuk, CPA, CA
Grant Thornton LLP
94 Commerce Drive
Winnipeg, MB R3P 0Z3

Membership Services Office

Executive Director
Gerry Hansen, BA
PO Box 46125 RPO Westdale,
Winnipeg, MB R3R 3S3
Phone: 204-897-5990/866-999-7111
Fax: 204-895-9595
executivedirector@ipac-canada.org

Deliveries only:
67 Bergman Crescent, Winnipeg, MB R3R 1Y9

Administrative Assistant
Kelli Wagner
Phone: 204-488-5027 Fax: 204-488-5028
Toll-Free: 1-855-488-5027
admin@ipac-canada.org

General Information
info@ipac-canada.org

IPAC CANADA CORPORATE MEMBERS

PLATINUM:
- **3M Healthcare**
(651) 250-4821, *www.3mcanada.ca*
- **GOJO Industries**
(800) 321-9647 ext. 6829, *www.gojo.com*
- **Diversey Inc.**
(800) 668-7171, *www.diversey.com*
- **Virox Technologies**
(800) 387-7578 (905) 813-0110
www.virox.com
- **The Clorox Company of Canada**
(866) 789-4973, *www.cloroxofcanada.ca*
- **Sani Marc**
(877) 726-4627, *www.sanimarc.com*

SILVER:
- **BD Canada**
(905) 288-6152, *www.hd.com/ca*
- **Ecolab Healthcare**
(651) 293-2914 (800) 352-5326
www.ecolab.com
- **HandyMetrics Corporation**
(416) 800-1743, *www.handyaudit.com*
- **Hygie Canada**
(450) 444-6777, *www.hygiecanada.com*
- **Prescient**[x]
(519) 749-5267, *www.prescientx.com*
- **Stryker**
(815) 455-4700, *www.stryker.com*
- **SC Johnson**
(519) 443-8697, *www.debmed.com*
- **Vernacare**
(416) 661-5552 ext. 232 Cell: (416) 580-9301
www.vernacare.ca
- **Webber Training**
(613) 962-0437, *www.webbertraining.com*

BRONZE:
- **AMG Medical**
514-737-5251, *www.amgmedical.com*
- **Arjo Canada Inc.**
(800) 665-4831, *www.arjo.com*
- **Cantel (Canada), Inc.**
(844) 348-5636, *www.cantelcanada.com*
- **Chem-Aqua**
(905) 457-2434, *www.chemaqua.com*
Email: *subrotoc@nch.com*
- **Citrón Hygiene**
(905) 464-0281/(800) 643-6922
www.citronhygiene.com
- **CSA Group**
www.csagroup.org
- **Ophardt Hygiene Technologies Inc.**
(905) 563-2760, *www.ophardt.com*
- **SciCan**
(416) 446-2757, *www.scicancanada.ca*
- **Steris Corporation**
(905) 677-0863, *www.steris.com*
- **The Stevens Company**
(905) 791-8600, *www.stevens.ca*
- **Wood Wyant**
(800) 361-7691, *www.woodwyant.com*

Now available

Clinically proven to address bacteria on the skin

Sage Antiseptic Body Cleanser with 2% Chlorhexidine Gluconate

- Helps reduce bacteria that can cause infection
- Provides rapid bacterial action
- Has persistent antimicrobial effect against a wide variety of organisms

Delivering incontinence skin protection

**Sage Comfort Shield®
Barrier Cream Cloths**

- Protects skin from incontinence episodes
- Makes skin assessment easy and allows the use of other products such as anti-fungals without removing dimethicone barrier[1]
- Helps eliminate mess of standard zinc oxide and petroleum-based barriers; makes cleanup easier

Reference: 1. West, D. (written communication-letter) December 2013

Sage Products LLC | 3909 Three Oaks Road | Cary, IL 60013 | sageproducts.ca | 800 323 2220
In Canada, imported by: Cardinal Health Canada Inc. Mississauga, ON L5T 1C2

Practice Recommendations for Infection Prevention and Control Related to Foot Care in Healthcare Settings

This position statement was developed by members of the IPAC Canada Reprocessing Interest Group:
Prinicipal Authors: Clare Barry BN,MSc,CIC[1], Anne Augustin MLT,CIC[2,3], Tina Stacey-Works MLT,CIC[4,5], Merlee Steele-Rodway RN,CERT[6,7], Nicole Kenny BSc Assoc Chem[1], Donna Perron RN,BScN,CIC[2,8], Mandy Deeves RN,BScN,MPH,CIC[1,2], Laura Farrell BSc,BEd,CPHI(C),CIC[2,9], Romy Burgess Burfitt RN[3,10], and Andrea Skeoch RN[11]

Affiliations:
[1] IPAC Canada – Greater Toronto Area
[2] Public Health Ontario
[3] IPAC Canada – Peel and Neighbouring Area
[4] Halton Healthcare
[5] IPAC Canada – Central South Ontario
[6] Canadian Association of Medical Devices Reprocessing
[7] IPAC Canada – Newfoundland and Labrador
[8] IPAC Canada – Eastern Ontario
[9] IPAC Canada – Western Ontario
[10] College of Health Studies
[11] IPAC Canada – Southern Alberta

Publication Date: November 2019

BACKGROUND

Foot care devices have been linked to healthcare-associated infections and outbreaks [1-7]. The goal is to provide infection prevention and control (IPAC) practice recommendations for foot care. This will include cleaning, disinfection and sterilization processes, and management of the environment, as well as client and healthcare provider safety.

Stakeholders

Healthcare providers performing foot care in any healthcare setting, which includes, but is not limited to, care provided in private homes, clinics, and healthcare settings.

This practice document is written for healthcare providers who provide foot care or reprocess critical foot care devices, and is not intended to address foot care practice performed by the client or the client's family.

Companion documents: IPAC Canada Position Statement on Reprocessing of Critical Foot Care Devices (2019) and the IPAC Canada Audit Tool for Foot Care.

PRACTICE STATEMENT

- The IPAC Canada Position Statement: Reprocessing of Critical Foot Care Devices shall be followed.
  Clients expect and require safe care regardless of where foot care is performed. Therefore, each client interaction requires a sterile set of critical foot care equipment/devices [8-10].
  - Reusable foot care equipment/devices are considered critical devices [8-14].
  - All healthcare providers are responsible for ensuring that the client is not placed at risk of infection when reusing any foot care equipment/devices during the provision of care.

https://doi.org/10.36584/CJIC.2020.001

Return to TABLE OF CONTENTS

- If a facility (e.g., acute care, retirement home, long-term care home), a client within the facility, or a client's family contract the foot care services of an independent provider, the facilities' management should perform a risk assessment and review of the external provider's services to ensure the current national, provincial and regulatory body standards and/or guidelines related to IPAC are practiced, including but not limited to medical device reprocessing [8-12].

Determining the best reprocessing option:

In-house reprocessing may not be cost-effective or timely for small establishments, and other options should be considered. When determining which reprocessing option to use; an organizational risk assessment should be performed [11].

Some points to consider:

- Types and frequency of procedures performed
- Types and complexity of the equipment
- Liability – complete responsibility for all aspects of reprocessing
  - Policies and procedures for all aspects of reprocessing
  - Quality assurance program
- Staff to do the reprocessing; space to do the reprocessing
- Ongoing staff education, training and competency to reprocess and operate equipment
  - Level of education is dependent on the organization risk assessment
- Cost
  - Capital to purchase reprocessing equipment (e.g., steam sterilizer, ultrasonic cleaner [optional], incubator for biological indicators)
  - Operating costs include but are not limited to: biological indicators, chemical indicators, preventative maintenance program for equipment, packaging system, labels, staff time, education and training of staff, physical space, and meeting provincial/territorial/national Occupational Health standards.

Options to achieve a sterile set of foot care equipment/devices for each client interaction include:

Option 1: Use single-use sterile disposable equipment/devices and discard after use; they must not be reprocessed, reused, or kept for future use with either the same client or different client [10,15,16].

Option 2: Reusable foot care equipment/devices reprocessed using the contracted services of a centralized Medical Device Reprocessing Department (MDRD). The contracted MDRD meets the CSA standards and has qualified technicians to perform the reprocessing (cleaning and steam sterilization).

Option 3: The healthcare provider chooses to reprocess reusable equipment/devices themselves following the guidance outlined in IPAC Canada's Position Statement on Reprocessing of Critical Foot Care Devices.

MANAGEMENT OF THE ENVIRONMENTS

There are two environments: the client care environment and the reprocessing area.

Foot care procedures shall be performed on clean surfaces. All healthcare providers shall have a documented IPAC plan with written policies and procedures, based on current standards and guidelines, for cleaning and disinfection of environmental surfaces and other equipment between clients [5, 12].

Healthcare providers undertaking reprocessing activities need to understand the potential for cross-contamination in the environment during the course of providing care and during cleaning, disinfection and sterilization procedures. The environment shall be designed to allow for one-way work flow from dirty to clean, with clear separation of clean and dirty instruments [12]. Regular, documented cleaning schedules shall be in place in the following areas:

- clinical care area
- reprocessing area
- where sterile supplies are stored [12].

Client Care Area

Cleaning and disinfection of the client care environment shall be performed between clients [5, 17].

- In any setting, client care environment includes the area the healthcare provider designates for foot care, and encompasses all surfaces, which may be touched by the client or the healthcare provider during care. This includes furniture (e.g., chair, table, exam table, footstool, toolbox/cart), any other equipment such as podiatry rotary tool/device, and any surface contaminated by nail clippings or nail dust.
- Cleaning and disinfection of all client care environments shall be performed with a hospital/healthcare grade low-level hospital/healthcare disinfectant that has a Drug Identification Number (DIN) from Health Canada. Manufacturer's instructions shall be followed [12, 17].
- Linens or disposable covers (e.g., paper covers, blue pads) shall be changed or discarded after each use prior to cleaning and disinfection of the treatment surface being protected [11,15,18].

Supplies and Accessories

- If a podiatry rotary tool/device is required for the provision of care, a dust-extracting drill is recommended to decrease environmental contamination and occupational exposure [19,20]. All devices used for foot care, including devices used for electronic nail filing, shall be intended by the manufacturer for use on humans [10,12-14].
  - Sanding [emery] bands shall be single use and disposed after use [9,10,13].
  - The dust bags and filters should be changed according to their manufacturer's instructions for use (MIFUs) and in compliance with current standards and legislation.
- If footbaths or basins are used to clean the feet, a single-use plastic liner is to be used and discarded after use, and the

basin is to be cleaned and disinfected as per manufacturer's instructions after each use.
- Products and linen should be stored in a clean area in a manner that prevents contamination (e.g., closed container, cupboard), until time of use.
- Sterile supplies/equipment shall be used for procedures that require sterility.
- Single-use antiseptics are preferred – to be used once only on a single client.
- Multi-dose antiseptics, medications, creams, lotions, should be single-client use [5]. Dispense in a manner that prevents contamination of the product. If a single use is not available, then use an applicator (sterile if indicated) or medicine cup to dispense from the multi-use product to prevent contamination. Date and label the multi-use product when opened. Products shall be monitored for expiration date and discarded when beyond use date has been met [15]. In addition, discard contaminated or potentially contaminated products and never top-up solutions [13,21].
- Single-dose vials for injectable medications are preferred and shall only be used for one client [11,22,23].
- If multi-dose vials for injection or infusion are used, they shall be dedicated to a single client and labelled with client's name. Vials shall be dated, stored and discarded according to manufacturer's recommendations, or within 28 days [11,22,23].
- All needles and syringes shall be single use [11,22].
- Never re-enter a vial with a used needle or used syringe [11,22,23].
- Single-use items including, but not limited to emery boards, orange sticks, podiatry [rotary] tool/device discs, and blades shall be discarded after use [9,10,13].

- **The following items shall be available at the point of care:**
  - Hand-washing sink and/or alcohol-based hand rub (ABHR)
  - Personal Protective Equipment (PPE)
    - Gloves, gowns, and face protection
    - PPE shall be single use
  - Puncture-resistant biohazard container that meets provincial regulatory requirements [24].
- There shall be a designated soiled area. In a clinic setting, the soiled area shall be separate from the client care area and the clean supply storage.
- There shall be a covered, puncture-resistant bin for collecting soiled instruments.

Storage of Sterile Medical Devices and Supplies
- Sterile packs, instruments, and supplies shall be stored outside of the client care area in a clean, dry, dust-free area [11,12].
- Maintain clean, sterile supplies in a closed container, shelf or drawer, away from the floor, waste, debris, drains, moisture, and sinks to prevent contamination. Maintain sterility until the time of use [10-12]. Product is not sterile if packaging is open, damaged, or wet. Check before using. Do not use if packaging integrity is in question [12].
- There shall be sufficient equipment available to allow for safe reprocessing practices.

Dedicated Reprocessing Area
- The reprocessing work area shall include a dedicated cleaning sink and be physically separate from the client care area and the designated clean and sterile storage areas. There shall be a designated one-way workflow from decontamination to the disinfection or sterilization area to prevent soiled items from coming into contact with clean and sterile items [12].
- Work surfaces shall be seamless and composed of a non-porous material so they can be cleaned, disinfected, and dried. These work surfaces shall be cleaned and low-level disinfected daily, or when visibly soiled [12].
- Environmental room monitoring is recommended: temperature (18-20°C for decontamination; 18-23°C for clean areas), relative humidity (30-60%), and air pressure/flow [12].
- Wherever cleaning and reprocessing is performed, follow the manufacturers' directions for use to ensure the occupational health and safety (OH&S) regulations are met for air quality.
- Chemicals shall be labelled, stored, and handled correctly according to the safety data sheets (SDS).
- Hand hygiene and eye wash facilities shall be readily available [12,25-27].
- Manufacturers' instructions for equipment maintenance and quality control shall be followed for all reprocessing equipment and documented.

TABLE 1: Cleaning schedule for clinics and reprocessing areas [12,17].

Space	Frequency
Sinks, counters, bathrooms and floors	Daily and when visibly soiled
Shelves: in reprocessing areas in sterile storage areas in clinical areas	 Daily Every 3 months Monthly
Walls and light fixtures	Every 6 months

Reprocessing of Foot Care Devices/Equipment

In the delivery of foot care services, equipment often intentionally or unintentionally comes into contact with blood, body fluids, or non-intact skin, requiring sterilization. **Therefore, it is imperative to manage all equipment as if it has been contaminated. Soil is not always readily visible. IPAC best practices indicate there should be one reprocessing system for all equipment for any client** [15].

Reprocessing of reusable foot care equipment/devices shall meet MIFUs, current national Canadian Standards Association (CSA) standards, and the guidelines from the Public Health Agency of Canada (PHAC/Health Canada) and provinces [9,12].

Spaulding's classification is used to determine how a device will be reprocessed, according to the perceived risk level [28]. Devices that may penetrate into sterile tissues or the vascular system require sterilization. Devices that contact non-intact skin, but do not come in contact with sterile tissues require, at a minimum, high-level disinfection. Sterilization is preferred [8,9,12].

For minimum levels of reprocessing, including the Adapted Spaulding's Classification of foot care equipment/devices, the management of burrs and use of podiatry rotary tools/devices, see the *"Reprocessing of Critical Foot Care Devices"* Position Statement.

Cleaning

All policies and procedures shall be written, adhered to, and in compliance with current provincial Occupational Health and Safety acts and associated regulations, provincial or federal guidelines for reprocessing of medical devices.

Selection and Use of Cleaning Agents

- Cleaning agent(s) shall be chosen based on the intended use and used as per manufacturers' instructions.
- Choice of cleaning agent(s) and cleaning process shall render equipment safe for handling during subsequent reprocessing steps.

Pre-Cleaning of Equipment

- Gross soil (e.g., tissue, blood) shall be removed immediately at point-of-use [12].
- If immediate pre-cleaning cannot be conducted, one of the following processes shall be used to prevent organic matter from drying: kept moist by using a lint-free towel moistened with water, soaking, or a pre-clean foam or gel product [12].
- Pre-cleaning is required before sending instruments out to a contracted facility for reprocessing.

Cleaning of Equipment

- Cleaning by manual or mechanical cleaning methods may be used (e.g., ultrasonic cleaner, washer/disinfector) after gross soil has been removed; followed by a thorough rinse.
- The equipment/device manufacturer's cleaning instructions shall be followed, including specifications for detergent type, water temperature and cleaning methods.
- Detergents and/or enzymatic detergents do not have a DIN from Health Canada
- If used, cleaner-disinfectant shall have a DIN from Health Canada and be used as per the MIFU.
- Document that cleaning was performed according to MIFU.
    - Household products have not been validated for cleaning medical devices and shall not be used.
- The process for cleaning shall include written protocols [12].
    - The cleaning process should include:
        - disassembly (if required),
        - sorting and soaking,
        - physical removal of soil,
        - rinsing,
        - drying,
        - physical inspection,
        - corrosion reduction/lubrication (if required),
        - packaging (if required)

STERILIZATION

Where the level of reprocessing recommended by the manufacturer is not in agreement with Spaulding's criteria [28], the more stringent level shall be used. For all sterilization, the end user shall follow CSA Z314-18 Canadian medical device reprocessing.

STEAM STERILIZATION

CSA standards for steam sterilization shall be met.

- Steam sterilization is the preferred method [12]. If purchasing a new sterilizer, "the preferred method of sterilization for heat-tolerant critical devices should be dynamic air removal steam sterilization rather than gravity displacement." [12]
- It is essential that healthcare professionals performing reprocessing of reusable foot care devices shall be knowledgeable and follow provincial and national standards for medical device reprocessing (e.g., Canadian Standard Association [CSA] – Z314-18 Canadian medical device reprocessing available on line at www.csa.ca). If unable to meet the required standards, other options shall be considered. For example, use only disposable equipment, or contract for a service by a centralized reprocessing facility.
- A steam sterilizer shall only be purchased from a qualified manufacturer (e.g., shall be licensed for sale in Canada and appear on the Medical Devices Active Licence List [MDALL]) and shall include a printout or data logger, have a wrapped cycle, and manufacturer's manual for care, operation and preventative maintenance.
    - Follow the manufacturer's guidelines regarding the type of water to be used in the steam sterilizer.

***Unacceptable methods of* sterilization** include Immediate-Use Steam Sterilization (IUSS - formerly referred to as flash sterilization), glass bead sterilizer, microwave oven, boiling, Chemiclave, steam sterilizers without printouts or electronic recording, and ultraviolet irradiation [8,9,12].

Multifunctional domestic appliances are also unacceptable for sterilization such as dishwashers, pressure cookers, and toaster ovens.

If an existing steam sterilizer does not have a printer or electronic recording device (USB), CSA recommends that there is a plan to update or replace the sterilizer to bring this into compliance with current standards.

Note: The use of liquid chemicals for sterilization of instruments is not supported for critical equipment/devices that are used for sterile procedures due to the limitations in maintaining sterility to point of use [29]. "Devices cannot be wrapped or adequately contained during processing in a liquid chemical sterilant to maintain sterility following processing and during storage." [29,30].

STORAGE AND TRANSPORTATION

Storage

- Clean/sterile supplies/medical devices:
  - Shall be stored in containers that can be easily cleaned (i.e., NOT in cardboard or paper boxes) [12]. External corrugated cardboard shall not be kept in clean storage area.
  - Shall not be stored on the floor, on a shelf below stored liquids, on window sills, or under sinks, but away from debris, drains, moisture, and vermin to prevent contamination and maintain sterility until the time of use [8,9,11,12].
  - Shall not be stored in an area accessible to clients [2,5,12] (e.g., client care rooms, procedure/exam rooms, public corridors).
  - Shall be stored within the temperature and relative humidity ranges specified on the manufacturer's label (typically relative humidity maintained between 30% and 60%) [12].
  - Storage space shall be sufficient to ensure packages are not crushed or damaged by overcrowding [11,12].
- Windows and doors in the storage area shall be kept closed [11].
- Stock should be rotated, so that oldest stock can be used first [12].
- There shall be no eating and drinking in the areas where clean/sterile supplies/medical devices are stored or handled or where client care is delivered [8,9,12].

Transportation

- Distribution of medical devices shall be performed using clean and either puncture-resistant enclosed or covered transportation carts, bins, and totes [12].
- Bins and plastic totes that are used for transportation of clean/sterile supplies/medical devices shall be cleaned between each use and when visibly soiled [12].
- Bins/containers used to transport soiled medical equipment/devices shall be cleaned after each use [12].
- Clean/sterile supplies/medical devices shall be transported separately from soiled supplies/medical devices to ensure the integrity of the clean/sterile supplies/medical devices are not compromised (e.g., two sealable rigid containers; one labelled "clean" for clean/sterile supplies/medical devices and one labelled "dirty" for soiled supplies/medical devices)
- Dirty reusable medical devices shall be pre-cleaned at point-of-use.

QUALITY ASSURANCE

- There shall be a designated individual who is responsible for reprocessing.
- Healthcare providers involved in reprocessing shall receive education and training appropriate to the volume and complexity of equipment to be reprocessed.
- Education is to be done on hire, annually and when new equipment or devices are purchased. Ongoing education and auditing shall include theoretical and practical components [10, 31,32].
- Develop written policies and procedures for sterilization of medical equipment/devices used in the clinical office setting that include cleaning, drying, inspection, disassembly, wrapping, sealing and labelling, transportation, and storage.
- Ensure that the manufacturer's instructions for installation, operation, cleaning, and preventive maintenance of the sterilizing equipment are followed.
- Ensure that sterilization cycles are in accordance with recommended parameters for proper reprocessing of all reusable instruments and as per MIFUs.
- Ensure documentation of sterilization parameters, for steam sterilization processes. Required documentation shall be kept as per CSA Z314-18 or provincial regulations [12].
- Test all sterilizers for performance using physical, chemical, and biological monitors and indicators as per CSA Z314-18 standards [12].
- A procedure shall be established for the recall of improperly reprocessed medical equipment/devices, i.e., in the event of a failed biological indicator (BI).
- There shall be an audit schedule set up to monitor environmental cleaning, Routine Practices and reprocessing procedures. Refer to Infection Prevention and Control Audit for Foot Care. Audit Toolkit Version 2 [32].
- An incident management process shall be in place to safely manage potential cross-contamination in the environment during the course of providing care and during cleaning, disinfection, and sterilization procedures. If there is a reported visual or cause for any cross-contamination, the processes shall be stopped, assessed with a root cause analysis, corrected, and verified to ensure safety. All devices involved in this process shall be cleaned and reprocessed prior to use on a client.

OCCUPATIONAL HEALTH & SAFETY

There shall be written policies and procedures outlining healthcare provider safety while providing foot care and/or reprocessing foot care equipment. These documents are to be in compliance with current provincial/national Occupational Health and Safety acts and associated regulations. Employers and educators shall ensure proper training and compliance with the recommendations, which are to be ongoing and audited. All healthcare providers shall adhere to the policies and procedures, and shall be aware of the possible health effects of their exposure to infectious agents and/or chemicals [12].

Immunization and TB Testing

- For all healthcare providers providing foot care and/or reprocessing foot care instrumentation the following is recommended:
  - Hepatitis B immunization, unless they have documented immunity to Hepatitis B [12,24,33].
  - All immunizations are kept current for measles, mumps, rubella, and annual influenza [12].
  - TB testing to follow current *Canadian Tuberculosis Standards*, 7th Edition 2013 [34] or provincial/organizational policies.

Sharps Management

- There shall be written measures and procedures to prevent and manage injuries from sharp objects [12,24,33,35].
- All sharps shall be handled in the following manner:
  - Place item for disposal in designated puncture-resistant container.
  - Do not recap needles.
  - Do not manually bend or break needles.
  - Take care when handling glass or other fragile objects.
  - Dispose of all sharps as per provincial/municipal legislation.
  - Follow current Transportation of Dangerous Goods Regulations [36].

Blood and Body Fluids

- Policies and procedures are written and readily available for immediate management of exposure to blood and body fluids [12,24,33].
- Healthcare providers are trained in the actions to follow for exposure. If a healthcare provider member has a blood-borne exposure, report and follow your organizational and or provincial Occupational Health and Safety Accidental Bloodborne Exposure Protocol.
- Healthcare providers shall be trained in management of a blood or body fluid spill [35].

Hand Hygiene

As stated by the Public Health Agency of Canada, "Adherence to hand hygiene recommendations is the single most important practice for preventing the transmission of microorganisms in health care and directly contributes to client safety." [18]. Adherence to proper hand hygiene (technique and opportunities) is the responsibility of all individuals involved in healthcare.

Each health care provider is accountable to follow the hand hygiene recommendations of their respective profession.

There are two methods of performing hand hygiene: [25,26,37,38]

- Visible soil on the hands: hand hygiene is performed with soap and water.
- No visible soil on the hands: healthcare provider may use either soap and water or an alcohol-based rub.

Hand and arm jewelry or nail enhancements should not be worn when providing client care; skin care for the provider is promoted.

Refer to the IPAC Canada's Hand Hygiene Practice Recommendations [38].

Education for Routine Practices

Healthcare providers are to receive education and training on the consistent use of Routine Practices, including the personal risk assessment and hand hygiene, to prevent exposure to blood and body substances in ***client care and reprocessing areas***.

- Eating/drinking, storage of food, smoking, application of cosmetics or lip balm, and handling of contact lenses in the client care or reprocessing area is not permitted [12].
- There shall be no storage of personal effects, including food and drink, in client care areas or the reprocessing area.
- **Personal Protective Equipment (PPE)**
  - ***A personal risk assessment*** is performed based on best practices to determine the PPE required.
  - PPE shall be readily available [18,39].
  - There shall be training and auditing that the PPE is worn correctly.
  - **When reprocessing equipment:**
  - PPE shall be worn for reprocessing activities according to CSA Z314-18 [12].
  - The following PPE shall be worn for cleaning and handling of contaminated equipment:
    - **Gloves:**
      - Glove use does not negate the need for hand hygiene [12,18,25,26,39].
      - Choice of glove is dependent on the setting and a risk assessment of the types of tasks to be done [12,18,39].
      - Face protection worn (i.e., full face shield OR fluid-impervious face mask and protective eyewear) and an impermeable gown [12].
    - **Hair Covering:**
      - Personnel shall confine all hair by wearing a clean hood or hair covering. Hair coverings shall be changed at least daily and more frequently if soiled. Bouffant and hood style covers are preferred [12].
  - **In the clinical area:**
    - ***A personal risk assessment*** is performed based on best practices to determine the PPE required for the specific foot care procedure being performed.
    - **Choice of respiratory protection is dependent upon a risk assessment of the types of procedures to be done (e.g., using a rotary tool/device) and your provincial Occupational Health and Safety legislation, or your local public health authority.**
    - **N95 respirators are generally recommended for nail reduction, particularly if the equipment does not include dust extraction or water spray** [40].

- Wear eye protection and surgical mask or fit-tested, seal-checked N95 respirator to reduce the possibility of inhaling nail dust generated during reduction of nails. The exposure of nail dust has been associated with conditions such as conjunctivitis, rhinitis, and occupational lung disease [19,41-44].
- Surgical masks or N95 respirators should fit snugly and be worn for one client only [39,41].

- **Respirator Fit Testing:**
  - Suppliers can often provide N95 respirator fit testing or contact an agency responsible for OH&S or IPAC in your area for information about fit testing.
  - Further information may be found via local IPAC Canada chapter(s) or the Canadian Centre for Occupational Health & Safety.
  - All PPE is removed and disposed of appropriately on completion of the task for which it is worn and before leaving the reprocessing area or when leaving the client's bedside/room, or chair.

Workplace Safety

- Workplace safety information is to be readily accessible for any chemicals used.
  - Information on WHMIS is available from the Health Canada website at: https://canada.ca/en/health-canada/services/environmental-workplace-health/occupational-health-safety/workplace-hazardous-materials-information-system.html
- If there is a risk of exposure to a biological and/or chemical agent, eye wash stations shall be provided and healthcare provider shall be trained on the use of eye wash station [27] ,
- **Work restriction:**
  - Skin shall be intact. Healthcare providers who have weeping dermatitis or exudative lesions shall refrain from providing direct client care or handling client equipment until the condition is healed.
  - Healthcare providers who have respiratory problems (e.g., asthma) should be assessed by OH&S or personal healthcare provider (e.g., physician, nurse practitioner) prior to working with chemical disinfectants or cleaning agents [12].

GLOSSARY:

Autoclave: Steam sterilizer

Client: Includes patient, client, resident

Critical Medical Equipment/Devices: Medical equipment/devices that enter sterile tissues, including the vascular system (e.g., biopsy forceps, foot care equipment, dental hand pieces). Critical medical equipment/devices present a high risk of infection if the equipment/device is contaminated with any microorganism, including bacterial spores. Reprocessing critical equipment/devices involves meticulous cleaning followed by sterilization [11].

Drug Identification Number (DIN): In Canada, low-level disinfectants are regulated as drugs under the *Food and Drugs Act* and regulations. Disinfectant manufacturers shall obtain a DIN from Health Canada prior to marketing, which ensures that labelling and supporting data have been provided and that it has undergone and passed a review of its formulation, labelling and instructions for use [8].

Detergent: A cleaning agent that increases the ability of water to penetrate organic material and breakdown greases and dirt. Detergents are needed to allow effective cleaning to take place. Use only detergents that are compatible with instruments being cleaned. Follow the detergent manufacturer's instructions for concentration, temperature, and recommended contact time.

Eye Protection: A device that covers the eyes and is used by healthcare providers to protect the eyes when it is anticipated that a procedure or care activity is likely to generate splashes or sprays of blood, body fluids, secretions or excretions, or within two metres of a coughing client. Eye protection includes safety glasses, safety goggles, face shields, and visors [39]. Prescription glasses are not eye protection.

Foot Care: Routine foot care includes a clinical assessment of the feet, education for the client/patient/resident, and care that only involves the epidermal layer of the skin or nails. Routine care may include the filing of corns or calluses, the filing or trimming of nails, and skin care. Invasive foot care includes contact with non-intact skin and surgical interventions with entry into or contact with the epidermal, dermal, deep fascial, and osseous structures. Foot care is performed by healthcare providers (e.g., chiropodists, podiatrists, nurses, advanced trained foot care nurses) within their defined scope of practice.

Healthcare Provider: Any healthcare professional delivering foot care service to a client as well as those performing reprocessing duties.

Healthcare Setting: Any location where healthcare is provided, including emergency care, pre-hospital care, hospitals, long-term care, home care, ambulatory care, and facilities and locations in the community where care is provided. Examples of healthcare settings include, **but are not limited to**, the following settings that shall be able to meet the reprocessing standards outlined in this document:

- Acute care/emergency/trauma hospitals
- Medical/surgical/ambulatory care clinics with or without overnight stay or observation
- All physician offices
- Nursing homes, long-term care, and assisted living facilities
- Rehabilitation facilities
- Group homes or residential facilities
- Hospice care facilities
- Educational institutions
- Correctional facilities
- Private homes where foot care is provided
- Foot care clinics

Hospital Disinfectant: A low-level disinfectant that has a DIN from Health Canada indicating its approval for use in Canadian healthcare settings. Hospital disinfectants were previously referred to as "hospital-grade disinfectants."

Low-Level Disinfection (LLD): Level of disinfection required

when processing non-invasive medical equipment (i.e., non-critical equipment) and some environmental surfaces. Equipment and surfaces shall be thoroughly cleaned prior to low-level disinfection [8].

Manufacturer's Instructions for Use (MIFU): The written instructions for use provided by the manufacturer or distributor of a product that contain the necessary information for the safe and effective use of the product [12].

Medical Devices Active Licence Listing (MDALL): Reference tool for licensed medical devices in Canada by Health Canada, accessible at https://health-products.canada.ca/mdall-limh/index-eng.jsp

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 [18].

Note: *The wearer shall do a seal-check: A procedure that the healthcare provider shall 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 shall receive training on how to perform a seal-check correctly [39,45].*

Personal Protective Equipment: Specialized clothing or equipment used by workers to provide a barrier or shield to prevent potential exposure to infectious microorganisms, and exposure to chemicals or physical hazards used or present during decontamination, sterilization, or provision of care. Note: PPE includes and is not limited to gowns, gloves, masks, facial protection (e.g., masks, eye protection, face shields, or masks with visor attachments), respirators, and hair covering [12].

Personal Risk Assessment: An evaluation of the interaction of the healthcare provider, the client/patient/resident and the client/patient/resident environment to assess and analyze the potential for exposure to infectious disease.

Routine Practices: Infection prevention and control practices to be used with all clients during all care, to prevent and control transmission of microorganisms in all healthcare settings. Routine Practices shall be incorporated into the culture of each healthcare setting and into the daily practice of each healthcare provider to protect both the client and healthcare provider [18,39].

Semi-Critical Medical Equipment/Device: Medical equipment/device that comes in contact with non-intact skin or mucous membranes, but ordinarily does not penetrate them (e.g., respiratory therapy equipment, transrectal probes, and specula). Reprocessing semi-critical equipment/devices involves meticulous cleaning followed by, at a minimum, high-level disinfection. Sterilization is preferred [8].

Single-Use/Disposable: A term given to medical equipment/devices designated by the manufacturer for single-use only. Single-use equipment/devices shall not be reprocessed [8].

Steam Sterilization: The basic principle of steam sterilization, as accomplished in an autoclave, is to expose each item to direct steam contact at the required temperature and pressure for the specified time. There are four parameters of steam sterilization: steam, pressure, temperature, and time [27]. Steam sterilization, dynamic air removal type: One of two types of sterilization cycles in which air is removed from the chamber and the load by a series of pressure and vacuum excursions (pre-vacuum cycle) or by a series of steam flushes and pressure pulses above atmospheric pressure (steam-flush-pressure-pulse cycle) [29].

Sterilization: The level of reprocessing required for critical medical equipment/devices. Sterilization results in the destruction of all forms of microbial life including bacteria, viruses, spores and fungi. Equipment/devices shall be cleaned thoroughly before effective sterilization can take place [8].

Surgical mask: A device that covers the nose and mouth is secured in the back and is used by healthcare providers to protect the mucous membranes of the nose and mouth [11].

As per Canadian Standards Association

"SHALL" is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard;
"SHOULD" is used to express a recommendation, or that which is advised but not required; and
"MAY" is used to express an option, or that which is permissible within the limits of the standard, an advisory or optional statement

REFERENCES

1. Centers for Disease Control and Prevention. Healthcare-Associated Hepatitis B and C Outbreaks Reported to Centres for Disease Control and Prevention (CDC) 2008-2017; 2018 Aug 21. Retrieved from: https://www.cdc.gov/hepatitis/outbreaks/pdfs/HealthcareInvestigationTable.pdf
2. Wise ME, Marquez P, Sharapov U, et al. (2012). Outbreak of acute hepatitis B virus infections associated with podiatric care at a long-term care facility. *Am J Infect Control*, 40(1), 8-21.
3. Wenger JD, Spika JS, Smithwick RW, et al. (1990). Outbreak of *Mycobacteruim chelonae* infection associated with use of jet injectors. *JAMA*, 264(3), 373-376.
4. Rutala, WA, Weber DJ, Thomann CA. (1987). Outbreak of wound infections following outpatient podiatric surgery due to contaminated bone drills. *Foot Ankle*, 7(6),350-419.
5. Wise ME, Bancroft E, Clement EJ, et al. (2015). Infection prevention and control in the podiatric medical setting: Challenges to providing consistently safe care. *J Am Podiatr Med Assoc.,* 105(3), 264-272.
6. Hathaway S, Marquez P, Bancroft E. Hepatitis B outbreak in a skilled nursing facility. Acute Communicable Disease Control 2008: Special Studies Report, Los Angeles County Dept. of Public Health: 43. Retrieved from: http://publichealth.lacounty.gov/wwwfiles/ph/dcp/acd/2008SpecialStudies.pdf
7. Calles DL, Collier MG, Khudyakov Y, et al. (2017). Hepatitis C virus transmission in a skilled nursing facility, North Dakota, 2013. *Am J Infect Control*, (45),126-32.

8. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Provincial Infectious Diseases Advisory Committee. Best practices for cleaning, disinfection and sterilization of medical equipment/devices. 3rd ed. Toronto, ON: Queen's Printer for Ontario; May 2013. Retrieved from: http://www.publichealthontario.ca/en/eRepository/PIDAC_Cleaning_Disinfection_and_Sterilization_2013.pdf
9. Best practices for cleaning, disinfection and sterilization in health authorities. Vancouver: British Columbia Ministry of Health. Patient Client Safety Branch; 2011. Retrieved from: http://www.health.gov.bc.ca/library/publications/year/2011/Best-practice-guidelines-cleaning.pdf
10. Canadian Association of Foot Care Nurses/Association canadienne des infirmieres et infirmiers en soins de pieds. National competencies for advanced nursing foot care in Canada. 2017. Retrieved from: https://cafcn.ca/wp-content/uploads/CAFCN-National-Competencies-for-Advanced-Nursing-Foot-Care.pdf
11. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Infection prevention and control for clinical office practice. 1st revision. Toronto, ON: Queen's Printer for Ontario; 2015. Retrieved from: www.publichealthontario.ca/en/eRepository/IPAC_Clinical_Office_Practice_2013.pdf
12. Canadian Standards Association. CAN/CSA-Z314-18 Canadian medical device reprocessing. Rexdale, ON: Canadian Standards Association; 2018.
13. Public Health Agency of Canada. Infection control guidelines: Foot care by providers. Can Commun Dis Rep 1997;(23S8). Retrieved from: http://publications.gc.ca/collections/collection_2016/aspc-phac/HP3-1-23-S8-eng.pdf
14. Alberta Health Services: Infection prevention and control best practices for foot care devices. 2013. Retrieved from: https://www.albertahealthservices.ca/ipc/hi-ipc-footcare-bpg.pdf
15. Center for Disease Control and Prevention. Guide to infection prevention for outpatient podiatry settings. 2018. Retrieved from: https://www.cdc.gov/infectioncontrol/pdf/Podiatry-Guide_508.pdf
16. Popalayar A, Stafford J, Ogunremi T, Dunn K. (2019). Infection Prevention in personal services settings: Evidence, gaps and the way forward. *CCDR*, 45/1.
17. Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infectious Diseases Advisory Committee. Best practices for environmental cleaning for prevention and control of infections in all health care settings. 3rd ed. Toronto, ON: Queen's Printer for Ontario; 2018. Retrieved from: https://www.publichealthontario.ca/-/media/documents/bp-environmental-cleaning.pdf
18. Public Health Agency of Canada. Routine practices and additional precautions for preventing the transmission of infection in health care. Ottawa, ON: Her Majesty the Queen in Right of Canada; 2012. Retrieved from: https://www.canada.ca/en/public-health/services/publications/diseases-conditions/routine-practices-precautions-healthcare-associated-infections/introduction.html
19. Burrow JG, McLarnon NA. (2006). World at work: Evidence based risk management of nail dust in chiropodists and podiatrists. *Occup Environ Med*, 63(10), 713–716.
20. United States Environmental Protection Agency. Recommended Cleaning and Disinfection Procedures for Foot Spa Basins in Salons: Step-by-step instructions for disinfecting pedicure foot spa equipment. 2018. Retrieved from: https://www.epa.gov/pesticides/recommended-cleaning-and-disinfection-procedures-foot-spa-basins-salons
21. IPAC Canada Position Statement on Medical Gels. 2017. Retrieved from: https://ipac-canada.org/photos/custom/Members/pdf/17Dec_Medical%20Gel_Final.pdf
22. APIC Position Paper: Safe injection, infusion, and medication vial practices in health care. 2016. Retrieved from: https://www.apic.org/Resource_/TinyMceFileManager/Position_Statements/2016APICSIPPositionPaper.pdf
23. Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infectious Diseases Advisory Committee. Updated guidance on the use of multidose vials; 2015. Retrieved from: www.publichealthontario.ca/-/media/documents/multidose-vials-guidance.pdf?la=en
24. Government of Canada. Canadian Centre for Occupational Health and Safety. Needlestick and sharps injuries; 2019. Retrieved from: https://www.ccohs.ca/oshanswers/diseases/needlestick_injuries.html
25. Public Health Agency of Canada. Hand hygiene practices in healthcare settings. Ottawa, ON: Her Majesty the Queen in Right of Canada; 2012. Retrieved from http://publications.gc.ca/collections/collection_2012/aspc-phac/HP40-74-2012-eng.pdf
26. Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infectious Diseases Advisory Committee. Best Practices for Hand Hygiene in All Health Care Settings. 4th ed. Toronto, ON: Queen's Printer for Ontario; April 2014. Retrieved from: http://www.publichealthontario.ca/en/eRepository/2010-12%20BP%20Hand%20Hygiene.pdf
27. Canadian Centre for Occupational Health and Safety. Eye wash station; 2019. Retrieved from: https://www.ccohs.ca/oshanswers/safety_haz/emer_showers.html
28. Spaulding EH. (1972). Chemical disinfection and antisepsis in the hospital. *J Hosp Res*, 9(1), 5-31.
29. Center for Disease Control (CDC). Guideline for disinfection and sterilization in healthcare facilities, 2008. Update: 2019 May. Retrieved from: https://www.cdc.gov/infectioncontrol/pdf/guidelines/disinfection-guidelines-H.pdf
30. Rutala WA, Weber DJ. (2019). Disinfection, sterilization, and antisepsis: An overview. *Am J Infect Control*, 47S, A3-A9.

31. Ontario Agency for Health Protection and Promotion (Public Health Ontario), Cividino M, Moore D, Deeves M. Recommendations for education, training and certification for reprocessing in clinical office settings. Toronto, ON: Queen's Printer for Ontario; 2016. Retrieved from: https://www.publichealthontario.ca/-/media/documents/recommendations-certification-clinical-office.pdf?la=en
32. IPAC Canada. Infection prevention and control audit for foot care. Audit Toolkit Version 2. 2015 Jan. Retrieved from: https://ipac-canada.org/ipac-canada-products-2.php
33. Ontario Hospital Association and the Ontario Medical Association Joint Communicable Diseases Surveillance Protocols Committee. Blood-borne disease surveillance protocol for Ontario hospitals. 2018. Retrieved from: https://www.oha.com/Documents/Blood%20Borne%20Diseases%20Protocol%20(November%202018).pdf
34. Public Health Agency of Canada, The Lung Association, Canadian Thoracic Society. Canadian tuberculosis standards, 7th ed. 2014. Retrieved from: https://www.canada.ca/en/public-health/services/infectious-diseases/canadian-tuberculosis-standards-7th-edition.html
35. Public Health Agency of Canada (PHAC). (1997). Infection control guidelines preventing the transmission of bloodborne pathogens in healthcare and public service settings. *Can Commun Dis Rep*, 23 (Suppl 3), i-vii, 1-43, i-vii, 1-52.
36. Government of Canada. Transportation of Dangerous Goods Regulations. 2019. Retrieved from: https://www.tc.gc.ca/eng/tdg/clear-download-372.htm
37. Public Health Ontario. Just clean your hands (JCYH) program. Retrieved from: https://www.publichealthontario.ca/en/health-topics/infection-prevention-control/hand-hygiene
38. IPAC Canada. IPAC Canada practice recommendation: Hand hygiene in healthcare settings. 2017. Retrieved from: https://ipac-canada.org/photos/custom/Members/pdf/17JulHand%20Hygiene%20Practice%20Recommendations_final.pdf
39. Ontario Agency for Health Protection and Promotion, Provincial Infectious Diseases Advisory Committee. Routine practices and additional precautions in all settings. 3rd ed. Toronto, ON: Queen's Printer for Ontario; 2012. Retrieved from: http://www.publichealthontario.ca/en/eRepository/RPAP_All_HealthCare_Settings_Eng2012.pdf
40. College of Chiropody of Ontario. Standards of practice for chiropodists and podiatrists infection prevention and control. 2018. Retrieved from: http://www.cocoo.on.ca/pdf/standards/standard-infection.pdf
41. Smith J, MacDougall C, Johnstone J, Copes RA, Schwartz B, Garber GE. (2016). Effectiveness of N95 respirators versus surgical masks in protecting workers from acute respiratory infection: systematic review and meta-analysis. *CMAJ*, 188(8), 567-574.
42. Donaldson CL, Carline T, Brown DM, Gilmour PS, Donaldson K. (2002). Toenail Dust Particles: a Potential Inhalation Hazard to Podiatrists? *Ann Occup Hyg*, 46(Suppl.1), 365–368.
43. Tinley PD, Eddy K, & Collier P. (2014). Contaminants in human nail dust: an occupational hazard in podiatry? *J Foot Ankle Res*, 7(15), 1-7.
44. Nowicka D, Nawrot U, Włodarczyk K, *et al*. (2016). Detection of dermatophytes in human nail and skin dust produced during podiatric treatments in people without typical clinical signs of mycoses. *Mycoses*, 59(6), 379-82.
45. Canadian Standards Association. CAN/CSA-Z94.4-18 Selection, Use, and Care of Respirators: Occupational Health & Safety. Rexdale, Ont.: Canadian Standards Association; 2018.

This document is endorsed by the Canadian Association of Medical Device Reprocessing.

CAMDR Canadian Association of Medical Device Reprocessing

ACRDM Association Canadienne en Retraitement Des Dispositifs Médicaux

OUTBREAK INVESTIGATION

Influenza and norovirus outbreaks in an inpatient mental health setting: Analysis and strategies for successful containment

Amber L. Linkenheld-Struk, BA, MLT, CIC; Natasha Salt, BSc, BASc, CIC; Jackie Griffin-White, BSc, RN, MSN

Sunnybrook Health Sciences Centre, Toronto, ON, Canada

Corresponding author:

Amber Linkenheld-Struk, BA, MLT, CIC, Infection Prevention and Control, Sunnybrook Health Sciences Centre, Toronto, ON, Canada, M4N 3M5
Tel: 416-480-6100 x7524 amber.linkenheld-struk@sunnybrook.ca

ABSTRACT

During the spring of 2019, an inpatient psychiatry unit at a large tertiary care hospital experienced two outbreaks between April 6 and May 7, first influenza A, with seven identified cases, followed by norovirus with three identified cases. This outbreak investigation examines the management of both outbreaks and highlights unique challenges, which may present in a mental health setting. While both outbreaks ultimately resulted in full recovery for all affected patients, considerations, such as impact to patient therapies, fomite transmission, shared spaces, access to psychiatric services and impact to mental health require innovative thinking. Unique outbreak management considerations, and strategies are examined.

INTRODUCTION

Despite the distinctive challenges posed to Infection Prevention and Control (IPAC) in a mental health setting, there is a dearth of research dedicated specifically to infection mitigation strategies in these areas. In light of this, challenges may arise in applying accepted standards for outbreak control when the situation presents itself, without clear guidance on alternative avenues for effective control.

During the spring of 2019, two discrete outbreaks occurred within the same inpatient psychiatric unit in a large Toronto tertiary care facility. This outbreak report will cover both an influenza A outbreak that was declared on April 6 and ended on April 17, 2019, and a norovirus outbreak that was declared on May 1 and ended May 7, 2019. This outbreak report will outline the course of these outbreaks, demonstrate that the inpatient psychiatric setting must be considered as a unique environment for outbreak management, requiring flexible mitigation strategies to support standard outbreak protocols, and attempt to demonstrate some broadly applicable strategies for all inpatient mental health settings.

Case definition/identifications

In both instances, cases were reviewed by IPAC professionals and outbreaks were declared compliant with Ontario Ministry of Health and Long-Term Care (MOHLTC) guidelines [1,2].

Nurses on the unit performed daily syndromic surveillance and contacted IPAC directly via phone or page if there were cases of concern and chart review and nursing interviews were conducted by IPAC to better typify the symptoms. For the influenza outbreak, cases were identified by both symptom presentation and laboratory confirmation through positive mid-turbinate (MT) swabs, which were tested by multiplex polymerase chain reaction (PCR) against a respiratory virus panel at an in-house laboratory. Norovirus samples were tested by the Public Health Ontario Laboratory (PHOL) via viral culture, but as results were returned after the outbreak was declared over, cases were line listed exclusively based on symptomatic presentation and the outbreak was managed as norovirus-like illness. As of November 2019, the PHOL changed to molecular testing for enteric viruses, but at the time of this outbreak, viral culture was in use [3].

OUTBREAK DESCRIPTION

Setting

The inpatient psychiatry unit consists of 35 inpatient beds broken down into 22 adult beds, five psychiatric intensive care beds (PICU) and eight adolescent beds. Within the adult unit, there is only one room designed for single occupancy. These areas are geographically linked, without corridors dividing them, but split by semi-restricted doors, which limit, but do not eliminate patient movement between rooms. Washrooms are divided by gender, and are shared

Conflict of interest: None

Funding: None

https://doi.org/10.36584/CJIC.2020.002

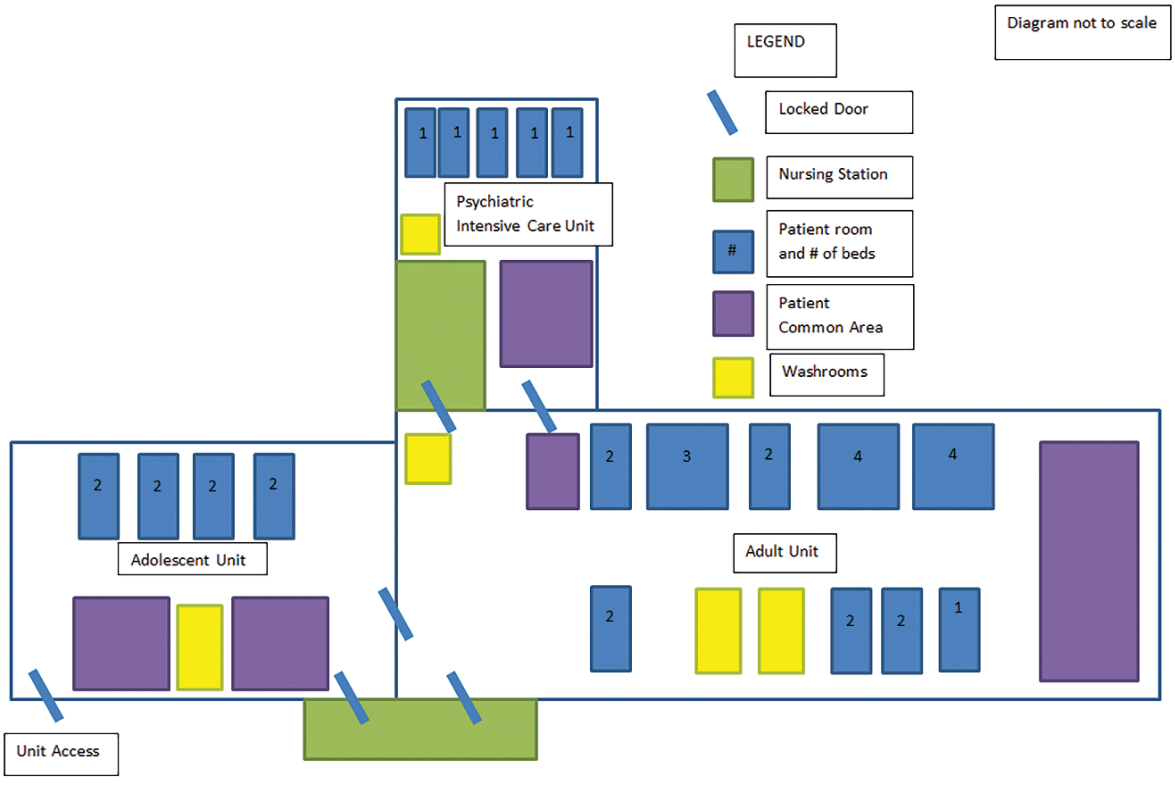


FIGURE 1: Physical layout of the inpatient psychiatry unit

stall-style spaces within the adult and adolescent areas with a single washroom being available on the PICU. All areas have shared spaces for patients, and PICU patients may typically access shared spaces in the adult area with a "pass", acuity dependent. The nursing station is linked between the adult and adolescent sides, and there is a single patient access to the entire unit via the adolescent area (Figure 1). Both outbreaks originated in the adult area, and the norovirus outbreak remained contained there.

The common areas for patient gathering and interaction as well as shared washrooms and dearth of single-patient rooms present as additional challenges in managing outbreaks as these features are not often present in standard acute care inpatient settings. Outside of mental health, there are generally no areas of patients to gather and socialize within the unit, and rooms have built-in toileting facilities and a larger number of private spaces are available. While this design can be acceptable due to increased patient mobility, and even necessary given the nature of treatments being received, it becomes extremely problematic when trying to contain a transmissible pathogen.

Like other acute care units, the inpatient mental health unit exists as part of a portfolio covered by an onsite IPAC professional, and is reviewed daily on weekdays for new cases of concern, and has 24 hours a day/7 days a week access to IPAC on call during off hours. This facilitates direct reporting occurring in a timely manner.

Influenza A

For the purposes of this outbreak, based on patient presentation, the case definition for the outbreak was established to be "A patient/resident or staff member with new onset of one or more of the following symptoms: fever, cough, runny nose, sore throat, hoarseness, congestion, shortness of breath (SOB), myalgia, or with confirmed laboratory results."

On March 30, a patient was admitted to the adult unit and within 72 hours had developed influenza-like symptoms. The patient was placed on droplet and contact precautions on April 2, and was found to have influenza A (H3N2). The morning of April 6, four additional nosocomial cases were identified with symptom onset greater than 72 hours after admission, presumably due to exposure to the community case (Figure 2).

All symptomatic patients were placed on droplet and contact precautions. Every effort was made to cohort symptomatic patients, and due to limitations in unit design, patients who could not be cohorted were placed on bed space precautions.

MT swabs were collected on all presenting patients, and testing was performed. Three of the four cases returned positive on April 6 for influenza A (H3N2), with no co-infecting viruses identified, and the fourth patient was negative for all respiratory viruses, however, they remained line listed due to case-compatible symptom presentation. An outbreak was declared on April 6, 2019.

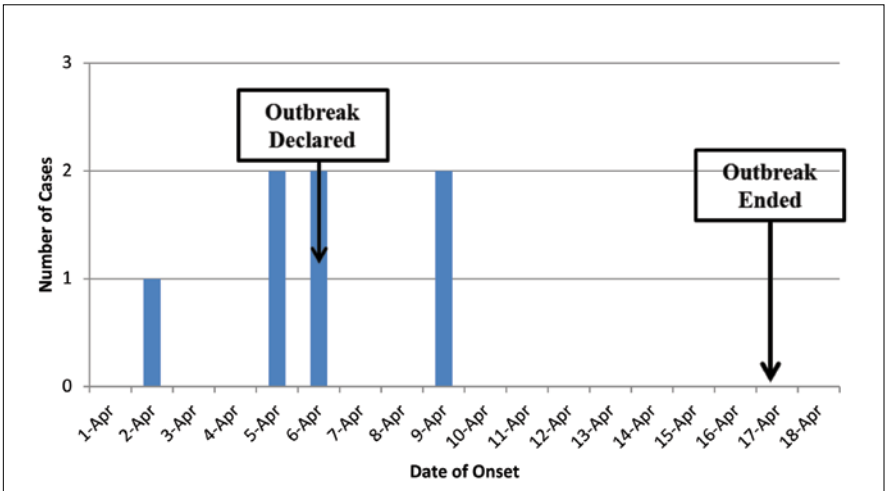


FIGURE 2: Influenza outbreak epidemic curve

As all cases had presented within the adult population, the decision was made to leave the adolescent area and PICU open to admissions, however, eliminate passes from PICU into the adult area. The adult unit was closed to admissions completely.

Oseltamivir treatment was offered to all cases and prophylaxis was offered to all exposed patients on the adult unit, as well as in the PICU, but not on the adolescent unit, as the risk was deemed low. One patient who was influenza positive declined to take treatment with oseltamivir, and one exposed patient declined prophylaxis.

On April 9, 72 hours after the outbreak was declared, two further symptomatic cases were identified. One was in the adult side, the patient who had declined to take prophylaxis, and one in the adolescent side. Both tested positive for influenza A (H3N2) by PCR. There were no sick visitors or staff identified on the adolescent side, thus the outbreak was geographically extended to include all areas in the psychiatry unit given this evidence of transmission.

No further transmission was noted after this point, and the outbreak ended eight days later, consistent with public health guidelines [1]. The attack rate among patients was 20% (7/35), and no staff or visitors reported symptoms during the period of the outbreak.

Norovirus

On May 1, 2019, IPAC was called with notification that two patients had experienced acute onset of copious vomiting and diarrhea (Figure 3). No other patients or staff reported illness, and the patients had not shared any common foods different than those served to the rest of the unit from hospital food services. Neither patient had an alternate explanation for the symptoms (i.e. withdrawal, medication change). As there was only one private room on the unit, the two affected patients were cohorted and placed on contact precautions.

Based on the presentation, an outbreak was called of norovirus-like gastrointestinal illness on the same day and the adult unit and PICU were closed to admissions. Environmental services staff were engaged to clean all bathrooms on the unit, and then a single washroom adjacent to the room of the affected patients was dedicated to symptomatic individuals. One patient who was discharged home on the date of the outbreak declaration called to inform the unit that he developed symptoms the day after his discharge on May 2. No further patients or staff on the unit developed symptoms and the outbreak was declared over on May 7. The attack rate was 14% (3/22) of admitted patients.

Lab results for viral culture returned from the PHOL after the outbreak had been declared over, and confirmed both patients, who were symptomatic on the unit, were positive for norovirus.

DISCUSSION

During the course of both outbreaks, unique considerations arose that were anticipated and unanticipated, some systemic issues, and some due to the population.

Infrastructure, supplies and environmental cleaning

At the outset of the influenza outbreak, it was found that the disinfectant wipes accessible to staff on the unit for equipment cleaning were still quaternary ammonia-based cleaners, as opposed

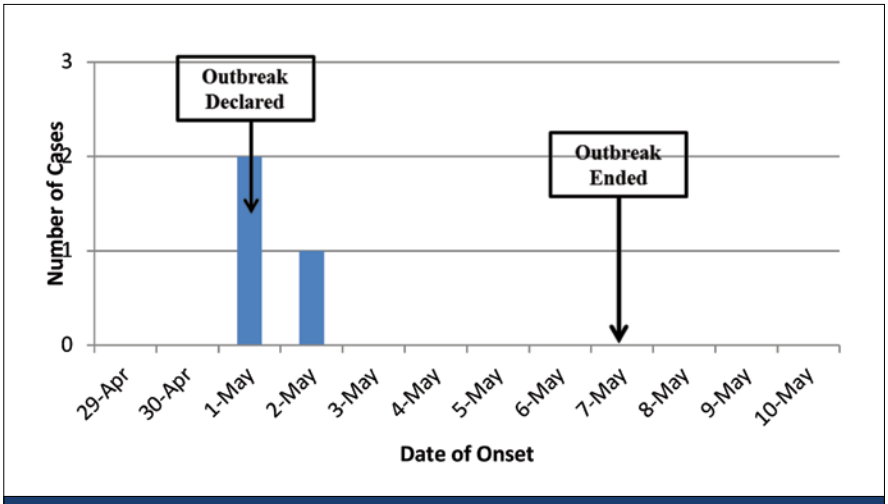


FIGURE 3: Norovirus outbreak epidemic curve

Return to TABLE OF CONTENTS

to hydrogen-peroxide-based cleaners available throughout the rest of the acute care areas of the facility. The transition to the hydrogen-peroxide-based cleaner was made immediately, and additional environmental services staffing was provided to focus on high-touch surfaces and shared spaces until the outbreak was declared over as required by MOHLTC guidelines.

The additional cleaning was particularly pertinent during the norovirus outbreak, where the ambulatory patient population and shared washroom spaces made transmission especially high risk. Games, books and any other non-wipeable objects were removed temporarily from patient common areas, to try and reduce the risk of fomite transmission.

At the outset of each outbreak, stored personal protective equipment (PPE) was in minimal supply, as procedures and interactions that would require PPE (line insertions, peri-care, wound dressings, etc.) are not generally needed or performed in the psychiatric setting at our facility.

Fortunately, amid the population admitted at the time, there was no concern for any patients consuming alcohol-based hand rub, thus supplies for hand sanitizer were available throughout the unit.

Staff

Collaborating with staff and senior leaders was important to successfully manage these outbreaks. Routine huddles and meetings supported active discussions about patient management, system challenges, staffing and environmental cleaning. They provided an opportunity to identify risks early and likely contributed to the low attack rates in both outbreaks.

When the influenza outbreak was declared, unit staff working on the weekend were unfamiliar with where to order or obtain additional PPE, which required hands on facilitation immediately after the outbreak meeting.

Similarly to how concerns arose with PPE, staff was not familiar with sample collection and test ordering protocols for norovirus testing and MT swabs, which again required direct guidance from IPAC to ensure samples were ordered appropriately.

Interestingly, these concerns around PPE and staff educational needs are an echo of the Gilbride et al 2009 paper, which examined a norovirus outbreak in an inpatient psychiatric unit, where they also described a lack of available PPE and staff knowledge as a barrier to effective outbreak control implementation [4]. The recurrence of this need across facilities seem to identify a gap in staff training that could potentially risk further outbreak propagation, or simply belay a lack of familiarity with the best way to manage patients on additional precautions for infection.

Specifically of concern for influenza, at the outset of the outbreak, vaccination rates among nursing staff on the unit were at 44%, well below the target of 80% set by the Government of Canada designed to ensure patient safety [5], and below the institutional average of 69% achieved during the 2018/2019 influenza season. Occupational Health and Safety attended to administer influenza vaccination and dispense oseltamivir prophylaxis to staff who had not yet been vaccinated for the 2018/2019 season. Any staff who declined vaccination were restricted from working on the unit for the duration of the outbreak, but the preventative benefit of high vaccination rates among staff had already been lost.

Patients

The patient population in a psychiatric inpatient setting faces unique challenges in outbreak management. As with an outbreak in any setting, a patient's admitting diagnosis can put individuals at greater risk, but behaviours within the population can magnify both the risk of adverse outcome, the behaviours that lead to acquisition, and increase difficultly of true case identification. Outbreaks and the associated restrictions present psychological stressors for any admitted patient, and within the course of our outbreaks, there was concern for patients reporting symptoms they did not objectively have (never observed by nursing staff), patients actively trying to infect themselves, patients who had adverse psychological reactions to the closure of the unit areas resulting in harm (i.e. refusing to take medications, physically attacking the environment resulting in harm and damages), and patients with magnified symptoms of paranoia resulting from back-to-back outbreaks. In these circumstances, outbreak propagation can occur as a direct result of patient behaviours [6].

In-house activities for asymptomatic patients were not suspended, neither were most common areas closed during either outbreak, though patients were no longer allowed to access shared food storage areas and had to request personal food be accessed by staff. Some services facilitated by volunteers or therapists who attended multiple sites, such as art therapy, were suspended for the duration of the norovirus outbreak to avoid spread between facilities. Vaccinated staff and volunteers were permitted to remain during the influenza outbreak.

Patients who were ill could not attend group therapy sessions as required for treatment, thus treatment interventions were limited in a way they typically are not in other settings.

IPAC conducted a town-hall-style meeting with all patients at the outset of the norovirus outbreak to explain the situation, answer questions, and attempt to allay concerns about the outbreak and educate patients on the best ways to remain protected. This approach was deemed a highly effective method of communication as patients were engaged from the outset of the outbreak to ensure consistent messaging and inclusion of patients in decisions that affect them.

Area mental health network

Beyond unit level concerns, the outbreaks in this setting also had major system level impacts for the institution, and indeed the mental healthcare network in the Greater Toronto Area. Because psychiatric patients cannot be bed spaced to other available beds within the hospital, and the unit was closed, ambulances with psychiatric patients had to be redirected and

when this was not possible, resulted in patients waiting extended periods in the emergency department until space could be found for them. Daily meetings with the network reviewed outbreak status and bed availability. Attempts were made to safely reopen a segregated area of the unit during the influenza outbreak after there had been 72 hours with no new cases, however, while this did not result in transmission, there was escalated behaviour in some at-risk patients due to new restrictions to movement around the unit.

CONCLUSION

Implementation of standard outbreak management protocols in our mental health setting presented some challenges. In particular, the set-up of the unit presented significant barriers to properly placing patients on additional precautions with use of a dedicated bathroom.

Key strategies that were effective in managing outbreaks in this setting included the town hall meeting with patients, increased presence of IPAC staff on the unit to guide staff in refreshers on personal protective equipment, sample collection and case finding, as well as removal of shared objects such as books and games which could easily serve as fomites. Enhanced cleaning also required more active following of ill patients who had to ambulate to shared bathrooms, rather than following a regular cleaning schedule. Furthermore, examination of behaviours and risk factors of the entire patient population were essential in order to allow for safe closure of a unit, a factor not typically considered in standard acute care settings, as anxieties generated in patients tend to be different. Duration of outbreak can also become important and workarounds may be needed should there be prolonged cessation of services provided by external therapists, as this can interrupt patient recovery even for those who are not line listed.

The collaborative design of infection prevention and control strategies to manage outbreaks in a mental health setting cannot be overemphasized. IPAC must work closely with the unit to understand practices which may be contributing to transmission. Staff unfamiliar with outbreak management will require extra support to implement control measures and collect specimens. Patients also play a key role in understanding the outbreak and preventing further spread. Open and transparent communication in these outbreaks contributed to successful management.

REFERENCES

1. Ministry of Health and Long-Term Care. (2019) *Infectious Diseases Protocol Appendix B: Provincial Case Definitions for Diseases of Public Health Significance: Disease: Respiratory Infection Outbreaks in Institutions and Public Hospitals*. Retrieved from: http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/respiratory_outbreaks_cd.pdf
2. Ministry of Health and Long-Term Care. (2019) Infectious Diseases Protocol Appendix B: *Provincial Case Definitions for Diseases of Public Health Significance: Disease: Gastroenteritis Outbreaks in Institutions and Public Hospitals*. Retrieved from: http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/gastro_outbreaks_cd.pdf
3. Public Health Ontario. (2019) *Labstract: Gastrointestinal Virus Testing Update*. Retrieved from: https://www.publichealthontario.ca/-/media/documents/lab/lab-sd-135-gastrointestinal-virus-testing.pdf?la=en
4. Gillbride, S. J., Lee B. E., Taylor, G. D., Forgie, S. E. (2009) Successful Containment of a Norovirus Outbreak in an Acute Adult Psychiatric Area. *Infection Control and Hospital Epidemiology*, 30(3), 289-291. DOI: 10.1086/595733
5. Government of Canada. (2019) *Vaccination Coverage Goals and Vaccine Preventable Disease Reduction Targets by 2025*. Retrieved from: https://www.canada.ca/en/public-health/services/immunization-vaccine-priorities/national-immunization-strategy/vaccination-coverage-goals-vaccine-preventable-diseases-reduction-targets-2025.html#det22
6. Weber, D., Sickbert-Bennett, E. E., Vinjé, J., Brown, V. M., MacFarquhar, J. K., Engel, J.P., Rutala, W. A. (2003) Lessons Learned from a Norovirus Outbreak in a Locked Pediatric Inpatient Psychiatric Unit. *Infection Control and Hospital Epidemiology*, 26(10), 841-843 DOI: 10.1086/502504

Return to TABLE OF CONTENTS

EMERGING TECHNOLOGIES

A novel imaging system for rapid visualization of bacteria on surfaces

Christine Greene, MPH, PhD;[1] Savannah Hatt, MPH[2]

[1]*TSG Consulting, Washington, DC, USA*
[2]*NSF International, Applied Research Center, Ann Arbor, MI, USA*

Corresponding author:

Christine Greene, MPH, PhD, Senior Scientific Consultant, TSG Consulting, 1150 18th Street, NW, Suite 1000, Washington, DC 20036, USA | Chris.Greene@tsgconsulting.com

ABSTRACT

The ability to identify locations that are missed in routine cleaning is important. Visual inspection, ATP bioluminescence systems, and fluorescence or ultraviolet light are monitoring methods that indicate overall cleanliness, but not contamination removal. In this study, we use *Staphylococcus aureus* to evaluate a novel imaging system that provides a rapid, visual confirmation of the presence of bacteria on surfaces at four log concentrations ranging from approximately $4.7x10^0$ to $1.8x10^4$ CFU/cm^2. We found that the combination of the illuminator spray and imaging software was able to detect the presence of bacteria on the surfaces and indicate relative concentration by visualizing the contamination as a heat map.

KEYWORDS:

Surface contamination, monitoring, imaging, *Staphylococcus aureus*

INTRODUCTION

Considerable evidence exists regarding the ability of surfaces to act as a reservoir for infectious pathogens, which can pose an infection risk to those who encounter them [1]. In order for a microorganism to present an infection risk in the physical environment, it must be able to both persist in the environment and cause disease once introduced to a susceptible human host. Many human pathogens have been shown to be capable of surviving for long periods of time outside the human host. For example, methicillin-resistant *Staphylococcus aureus* (MRSA) has been shown to survive for up to a year on surfaces such as floors, furniture, dust and *Acinetobacter baumannii* can resist desiccation for as long as eight weeks [2, 3]. Several other pathogens such as vancomycin-resistant *Enterococcus* (VRE), *Clostridium difficile* and gram-negative rods have been shown to be able to survive the harsh environment for varying lengths of time posing an infection risk to patients and staff [4]. Studies have implicated environmental surfaces in the transmission of pathogens [5, 6]. Given the role of environmental surfaces in the transmission of contamination that can either directly or indirectly contribute to healthcare-associated infections, it is important for facilities to implement a cleaning audit program to ensure adherence to the facilities' approved cleaning protocols and identify employees who may require additional training [1, 4].

The most widely used audit tools for cleaning include visual inspections, fluorescent marking, adenosine triphosphate (ATP) bioluminescence and microbial swabbing. Visual inspections provide a very easy and inexpensive way for quick assessments of cleanliness, but do not allow for a reliable assessment of contamination removal [7]. ATP bioluminescence systems detect the presence of ATP on surfaces (as Relative Light Units, RLU), which correlate to the amount of organic matter present on a surface. A systematic review by Nante *et al* (2017) concluded that ATP bioluminescence testing was a better alternative to visual inspections, but that the limitations of this test must be considered [8]. For example, the benchmarks for the ATP systems vary widely by manufacturer, ranging from 45 RLU to 1000 RLU and the chemical residuals left behind from cleaning interacts with the test causing an artificially high or artificially low reading. Further, since the test is indiscriminate to the source of ATP, the results reflect all sources of ATP including milk, food, human cells, urine and bacteria [9, 10]. The most accurate way to assess the presence of microbial contamination is by way of microbiological swab testing for total aerobic colony counts (ACC) expressed as colony forming units (CFU) per surface area. However, microbial swab testing is more costly, has longer turnaround times, and is often reserved for use during epidemiological investigations.

In this study, we evaluate a novel monitoring technology that offers rapid identification of the presence of bacterial contamination on a surface. This technology uses fluorescence labeling and multi-spectrum imaging. It involves the application of an illuminator spray to the surface, which contains a dye that

https://doi.org/10.36584/CJIC.2020.003

binds to bacterial DNA allowing the bioburden to be visualized during the imaging process. The images are captured using a customized, multi-spectrum camera and processed using proprietary software to determine if bacterial contamination is present on a surface along with the relative amounts. The aim of this study is to assess the accuracy of this technology in detecting bacterial cells on a surface.

METHODS

Microbiological methods

Staphylococcus aureus ATCC 43300 was cultured in Tryptic Soy Broth and incubated at 35.0 ± 1.0°C for 18-24 hours for all experiments. Bacterial counts were serially diluted in Butterfield's Phosphate Buffer. In a sterile biological cabinet, 20 µl of an overnight suspension were spread onto 24 individual sterilized stainless steel carriers (2.54cm x 7.62cm) in 10^{-1}, 10^{-2}, 10^{-3}, and 10^{-4} dilutions. The initial inoculum count was quantified on 12 carriers using 3M Petrifilm Aerobic Count Plates. Carriers were submerged in Letheen Broth and vortexed for 30 ± 3 seconds prior to dilution and plating.

Imaging protocol

The camera was fitted to a tripod, which remained stationary during the imaging protocol.

An initial image sequence was taken of the remaining 12 carriers before application of the illuminator spray using OptiSolve Pathfinder camera (a Canon T6 Rebel fitted with propriety attachments) for baseline images. Each slide was then sprayed with two pumps (approximately 0.1 mL) of the OptiSolve Illuminator via a spray bottle and allowed to dry for 30 seconds. Once dry, each carrier was photographed again using the OptiSolve Pathfinder camera to generate image sequences after the application of the illuminator spray. All photographs were processed using the OptiSolve software which uses an algorithm to generate the final composite image.

RESULTS

Baseline images were taken of all slides after inoculation with *S. aureus*, but prior to the illuminator spray application (not shown). These baseline images were used to help confirm the absence of background noise, but it was very difficult to visualize the actual areas of inoculation. Once the spray was applied, areas of inoculation can be clearly seen at concentrations of 10^4 CFU/carrier or higher (Figure 1, C and D) and is somewhat discernible at 10^2 CFU/carrier followed by 10^1 CFU/carrier (Figure 1, A and B).

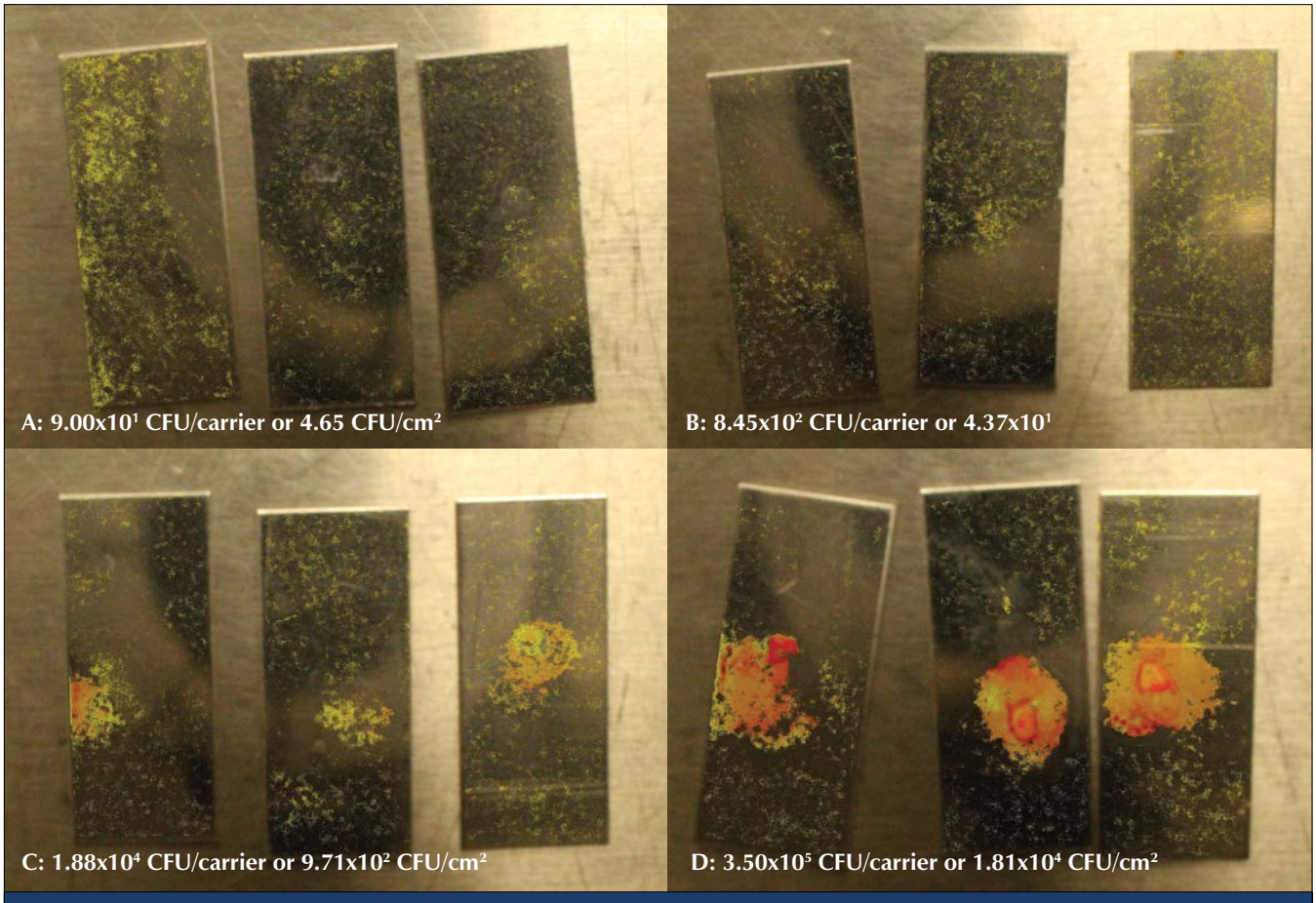


FIGURE 1: Images of carriers inoculated with *Staphylococcus aureus* (in triplicate) after two spray treatments with the OptiSolve Illuminator spray and visualized using the OptiSolve software. Initial inoculum concentration estimates are shown.

Return to TABLE OF CONTENTS

The OptiSolve software indicates greater concentration of the bacteria through a heat map and colour intensity ranging from yellow (lower in concentration) to bright red (higher in concentration). For the lower inoculums (10^1 to 10^2 CFU/carrier), areas of low concentration of bacteria on each carrier was visualized (yellow color). For the higher inoculums (10^4 to 10^5 CFU/carrier), areas of moderate to high concentrations of bacteria was visualized (orange and red in color) with the reddest areas present on the slides with the highest concentration of inoculum (10^5 CFU/carrier), (Figure 1).

DISCUSSION

This is the first study evaluating a technology that uses fluorescence and imaging to assess bacterial contamination on inanimate objects. The ability to monitor the efficacy of cleaning processes is important since people in busy hospital environments can become exposed to infectious microorganisms from contaminated hands, surfaces, or equipment [11]. Further, high-touch surfaces can be easily missed in cleaning, disinfection, and sanitation protocols which is a concern in the case of difficult-to-clean equipment [12].

We evaluated a novel approach that uses fluorescence labelling and multi-spectrum imaging to assess microbial surface contamination. The system works by first spraying the surface with an illuminator spray containing a dye that binds to bacterial DNA, allowing for the visualization of bacteria during the imaging process. The illuminator spray was a clear liquid that was not readily visible to the naked eye once dry, nor did it leave behind any indelible marks on the stainless steel carriers used in this study. Once applied, the sprayed liquid must be allowed to dry before taking the image (approximately 30 seconds). A camera that is customized to emit various spectrums of light while capturing a sequence of images is then used to take the photograph (OptiSolve Pathfinder). The maximum field size for a single-image capture is approximately 21.59cm x 27.94cm, which allows for the imaging of most high-touch surface areas. The images are processed through a proprietary algorithm generating a final, composite image, which portrays the relative quantity of bacteria present in the form of a heat map, ranging from low concentration (yellow) to high concentration (red).

We tested the ability of this technology at four low-bacterial concentrations (10^1, 10^2, 10^4 and 10^5 CFU/carrier) on stainless steel surfaces and found that this tool functioned as a semi-quantitative proxy to gauge relative amounts of bioburden. At lower concentrations (10^1 and 10^2 CFU/carrier), the point of inoculation on the stainless-steel carrier is less obvious – but as the inoculum concentration increases from 10^1 to 10^5 CFU/carrier, the relative bacterial concentration can be interpreted from the density and colour of the images (Figure 1, A-D). At higher concentrations of bacteria (10^4 and 10^5 CFU/carrier) areas of red, orange and yellow can be readily seen on each carrier (Figures 1, C and D). We found that the OptiSolve surface imaging technology could detect the lowest concentration of *S. aureus* tested, 90 CFU/per carrier or 4.65 CFU/cm^2. Since the threshold for microbial monitoring of high-touch surfaces is ≤ 2.5 CFU/cm^2 [7], additional testing would be needed to determine the sensitivity of the tool below this level. It is important to note that the camera detects the emission of the fluorescent label, which is assumed to be representative of bacterial cells on the surface. It does not directly detect the cells.

This approach could potentially provide a new, rapid way for approximating the quality of contamination removal from a surface and facilitate precision cleaning processes. However, there are some important limitations that should be taken into consideration. First, the dye used in the illuminator spray does not differentiate between live and dead cells. As such, extracellular DNA, which can be passively released from dead cells or actively released from physiologically active cells, and extracellular DNA that is prominent in a biofilm, is picked up in the imagery. Since the spray is solvent based, it cannot be used on soft, polymer or paint-coated surfaces, and must be wiped away from the surface after the image is captured, limiting the types of surfaces that can be imaged. Also, fluctuations in lighting conditions could impact signal variations and affect the resulting imagery. While we did not evaluate the safety of this product, the label bears a flammable and an irritation warning, suggesting the use of gloves and safety glasses during use.

A limitation of this study is that a pure culture of *S. aureus* was tested without the addition of artificial test soils. Therefore, our results may reflect a higher level of sensitivity than what might be seen in the environment where a variety of types of contamination, including blood, feces or other organic carbon materials are present. However, the purpose of this technology is to monitor surfaces after they have been cleaned and organic materials should have been cleaned from the surface.

The OptiSolve Pathfinder can be used as a training tool, to optimize cleaning protocols, or to identify surface locations that are missed in routine cleaning. Because it is qualitative in nature, it is not recommended to be used to validate disinfection or sterility. However, this novel technology is specific to bacteria and presents a viable alternative for assessing the overall quality of surface disinfection. Additional studies are necessary to determine if disinfectant chemical residuals on surfaces interfere with the illuminator spray, to measure the sensitivity of the technology to other bacteria as well as viruses and spores, and to evaluate the capacity for this technology to detect the impact of environmental cleaning.

REFERENCES

1. Suleyman, G., Alangaden, G., Bardossy, A.C. (2018). The Role of Environmental Contamination in the Transmission of Nosocomial Pathogens and Healthcare-Associated Infections. *Current Infectious Disease Reports*, 20(6), 12. doi: 10.1007/s11908-018-0620-2.
2. Dancer, S.J. (2009). The role of environmental cleaning in the control of hospital-acquired infection. *Journal of Hospital Infection*, 73(4), 378-385.

3. Greene, C., Vadlamudi, G., Newton, D., Foxman, B., Xi, C (2016). Influence of biofilm formation and multidrug resistance on environmental survival of clinical and environmental isolates of *Acinetobacter baumannii*. *American Journal of Infection Control*, 44(5), e65-71. doi: 10.1016/j.ajic.2015.12.012.
4. Weber, D.J., Rutala, W.A. (2013). Understanding and preventing transmission of healthcare-associated pathogens due to the contaminated hospital environment. *Infection Control & Hospital Epidemiology*, 34(5), 449-52.
5. Dyer, D., Hutt, L.P., Burky, R., Joshi, L.T. (2019). Biocide Resistance and Transmission of *Clostridium difficile* Spores Spiked onto Clinical Surfaces from an American Health Care Facility. *Applied and Environmental Microbiology*, 85(17), e01090-19; DOI: 10.1128/AEM.01090-19.
6. Manning, M.L., Archibald, L.K., Bell, L.M., Banerjee, S.N. and Jarvis, W.R. (2001) *Serratia marcesans* transmission in a pediatric intensive care unit: a multifactorial occurrence. *American Journal of Infection Control*, 29, 115-119.
7. Mulvey, D., Redding, P., Robertson, C., Woodall, C., Kingsmore, P., Bedwell, D., Dancer, S. (2011). Finding a benchmark for monitoring hospital cleanliness. *Journal of Hospital Infection*, 77, 25-30.
8. Nante, N., Ceriale, E., Messina, G., Lenzi, D., Manzi, P. (2017). Effectiveness of ATP bioluminescence to assess hospital cleaning: a review. *Journal of Preventive Medicine and Hygiene*, 58(2), e177-183.
9. Lewis, T., Griffith, C., Gallo, M., Weinbren, M. (2008). A modified ATP benchmark for evaluating the cleaning of some hospital environmental surfaces. *Journal of Hospital Infection*, 69, 156-163.
10. Boyce, J.M., Havill, N.L., Lipka, A., Havill, H., Rizvani, R. (2010). Variations in hospital daily cleaning practices. *Infection Control & Hospital Epidemiology*, 31(1), 99-101.
11. Russotto, V., Cortegiani, A., Raineri, S.M., Giarratano, A. (2015). Bacterial contamination of inanimate surfaces and equipment in the intensive care unit. *Journal of intensive care*, 3(1), 54.
12. Messina, G., Ceriale, E., Lenzi, D., Burgassi, S., Azzolini, E., Manzi, P. (2013). Environmental contaminants in hospital settings and progress in disinfecting techniques. *BioMed Research International*, (429780), 8 pages. http://dx.doi.org/10.1155/2013/429780.

EMERGING TECHNOLOGIES

An evaluation of conventional cleaning and disinfection and electrostatic disinfectant spraying in K-12 schools

B. Douglas Ford, MA;[1]Keith Sopha, CEM[1,2]

[1]*Canadian Association of Environmental Management, Kingston, ON, Canada*
[2]*CleanLearning*

Corresponding author:

B. Douglas Ford, MA, Senior Researcher, Canadian Association of Environmental Management, 5-447 Palace Road, Kingston, ON, Canada, K7L 4T6
Tel: 613-331-4269 | bdford42@gmail.com

ABSTRACT:

Background: Microbes endemic to student desks can survive for long periods and infect students. The effectiveness of conventional cleaning and disinfection practices and electrostatic disinfectant spraying were examined.

Methods: Six K-12 schools in Southeastern Ontario participated in the study. The viable microbial loads on 100 student desks were assessed via Replicate Organism Detection and Counting (RODAC) plates before and after cleaning and disinfection procedures.

Results: The adjunctive effect of electrostatic disinfectant spraying was tested on 36 desks. Mean pretest colony-forming units (CFUs) per desk were 126.8 (SD 95.7), after conventional cleaning and disinfection mean CFUs were 73.4 (SD 93.0) ($t = 4.0$, $P = 0.0003$), and subsequent electrostatic disinfectant spraying further reduced mean CFUs to 54.2 (SD 85.0) ($t = 2.6$, $P = 0.02$). The independent effect of electrostatic disinfectant spraying without an intervening conventional cleaning step was tested on 64 desks. Mean pretest CFUs were 106.4 (SD 94.5) and after electrostatic disinfectant spraying mean CFUs decreased to 62.9 (SD 87.1) ($t = 3.3$, $P = 0.001$).

Conclusions: Conventional and electrostatic disinfection methods were both effective in increasing the hygienic state of student desks. Electrostatic disinfection spraying improved hygienic state when conducted after conventional cleaning and disinfection and when used independently.

KEYWORDS:

Cleaning; Disinfection; School; Electrostatic Spray

INTRODUCTION

Schools are rife with numerous and various bacteria, viruses, and fungi [1,2]. Student desktops in K-12 schools are contaminated with bacteria such as *Streptococcus* and *Staphylococcus* and viruses such as influenza and norovirus [1,2]. Many bacteria and fungi pathogens can live on desks for months and influenza, common cold, and noroviruses for days [3]. Effective cleaning and disinfection of classrooms can neutralize these pathogens and reduce student absenteeism [1].

Conventional cleaning and disinfection in schools involves manually applying cleaning and disinfection solutions and wiping with cloths. This method has variable effectiveness in schools [1,2]. Spray-and-wipe cleaning and disinfection procedures in healthcare settings frequently do not achieve the desired level of decontamination [4].

Newer technologies such as ready-to-use wipes, ultraviolet light towers, and hydrogen peroxide fogging units are being used for the cleaning and disinfection of hospitals [5-7]. The electrostatic spraying of disinfectants is a newer technology, which could be readily used in schools [8]. The electrostatic sprayer sends a negatively charged plume of disinfectant that envelopes sprayed objects and the charged particles repel each other on surfaces leading to more uniform disinfectant coverage. The disinfectant plume can also reach locations where pathogens are not readily accessible to manual spray bottle and wiping procedures.

The study objective was to assess the effectiveness of conventional cleaning and disinfection and adjunctive and independent use of electrostatic spray disinfection technology on the general hygienic state of student desks.

METHODS

General hygienic state sample collection

The six schools in the study were a convenience sample from Southeastern Ontario. The 20 classrooms sampled ranged from kindergarten to high school. The viable bacterial and fungal

Acknowledgements: Mary Sopha, CleanLearning is thanked for her contributions to the project which included photography and aiding in data collection.

Conflicts of Interest: *None.*

Funding: The research was funded by Clorox Professional Products Company Canada in the form of an Unrestricted Educational Grant to the Canadian Association of Environmental Management.

https://doi.org/10.36584/CJIC.2020.004

FIGURE 1: Replicate Organism Detection and Counting (RODAC) agar plate, which was sampled from a student desk at the end of the school day before cleaning and after five days incubation.

loads on 100 student desks were assessed using Replicate Organism Detection and Counting (RODAC) agar plates. Thirty-six desks were sampled at baseline, after conventional cleaning and disinfection, and again after electrostatic disinfection. An additional 64 desks were sampled at baseline and after electrostatic disinfection without an intervening conventional cleaning and disinfection step.

The study was conducted December 2018 to March 2019. Desks were sampled at the end of the school day before cleaning and disinfection interventions. After cleaning and disinfection interventions were conducted, RODAC sampling took place after ~30 minutes in order to allow the desks to dry completely. Sampling was conducted on the lower middle portion of desktops where students have the most contact with the desk. Pretest and later samplings on the same desk were taken close to one another. Samplings could not be taken from the exact same location due to possible contamination from the initial sampling with agar plates.

RODAC plates allow for surface sampling of bacteria and fungi which grow on the agar medium. The RODAC plate brand used was Remel Contact Sterile Tryptic Soy Agar with Lecithin and Polysorbate 80 (OXOID, Cat # R111800). This brand provided a general assessment of microbial contamination and measured general hygienic state. The plates were in sterile packaging, stored at 2-8°C, and transported to, within, and from schools in a cooler. Prior to use, the plates were warmed to room temperature for 15-20 minutes in the original packaging. The RODAC plate bags were opened while wearing sterile disposable surgical gloves on sterile towels. A gloved index finger was used to press the agar surface firmly against the desk for five seconds while ensuring the plate did not slide. Sample code, date, and time were written on the agar bed plate with a permanent marker. The RODAC plate samples were transported to CREM Co labs in Mississauga, Ontario (*http://www.cremco.ca/*) within 18-20 hours of collection and incubated aerobically at 36±1°C for five days. Total colony-forming units (CFUs) were manually counted for each plate after incubation (Figure 1). In cases where microbial colonies were too numerous to count, a value of 250 CFUs was assigned [9].

Cleaning and disinfection interventions

School-employed custodians were instructed to clean and disinfect classrooms in their usual manner. Custodians were asked about cleaning methods and the products they used. In all schools, this method was cleaning and disinfecting in one step; referred to as one clean. Schools used spray bottles and cloths or solution, bucket, and cloth with hydrogen peroxide or quaternary ammonium solutions. Electrostatic spray disinfection technology consisted of an electrostatic sprayer and quaternary ammonium disinfectant solution containers mounted on a portable cart [8]. A skilled manufacturer's representative or a trainee under their supervision used the electrostatic spray disinfection technology to spray the classrooms.

Statistical analysis

Repeated Measures ANOVA with Dependent T-test multiple comparisons tested the effectiveness of conventional cleaning and disinfection and the subsequent use of electrostatic spray disinfection technology. The Repeated Measures analysis allowed for comparisons of the same dependent variable on the same desks for pretest, conventional, and electrostatic conditions. Dependent T-tests were also used to assess the disinfection effect of electrostatic spraying without an intervening conventional cleaning and disinfection step. Repeated Measures ANOVAs were also used to assess the differential effect of independent conventional and electrostatic disinfection procedures. The StatView 5 statistical package was used to analyze the data.

RESULTS

RODAC plate control samples

The examination of the adjunctive effectiveness of electrostatic spraying involved the use of 108 RODAC plates to assess pretest, conventional, and electrostatic conditions over 36 desks. The assessment of the independent effectiveness of electrostatic spraying, where there was no conventional cleaning and disinfection step, used 128 plates to assess pretest and electrostatic conditions over 64 desks. The first RODAC plate in each package of 10 was marked as a control sample to ensure no contamination occurred during the manufacturing, storage, sampling, and/or transportation to and from the lab. There were a total of 24 control samples and no control sample indicated any viable microbial life following incubation for five days.

Adjunctive effectiveness of electrostatic spray disinfection technology

Cleaning and disinfection procedures, in general, decreased viable microbial counts on 36 student desks ($F = 19.5$, $P < 0.0001$).

Return to TABLE OF CONTENTS

TABLE 1: Dependent T-Test Multiple Comparisons for Cleaning and Disinfection Procedures						
Condition Comparisons	**Mean Difference**	**t-Value**	**df**	**P value (2-tailed)**	**95% Lower Confidence Limit**	**95% Upper Confidence Limit**
Pretest-Conventional Cleaning	53.4	4.0	35	.0003	26.6	80.2
Pretest-Electrostatic Spray	72.5	5.1	35	< .0001	43.5	101.5
Conventional Cleaning – Electrostatic Spray	19.1	2.6	35	.02	3.9	34.4

Desktops were less contaminated after conventional cleaning and disinfection ($t = 4.0$, $P = 0.0003$) and desks were even less contaminated when electrostatic spray disinfection followed conventional cleaning and disinfection ($t = 2.6$, $P = 0.02$) (Table 1). Mean pretest CFUs were 126.8 (SD 95.7), after conventional cleaning and disinfection mean CFUs were 73.4 (SD 93.0), and subsequent electrostatic disinfectant spraying further reduced mean CFUs to 54.2 (SD 85.0) (Figure 2).

Independent effectiveness of electrostatic spray disinfection technology

In order to test the independent effect of electrostatic disinfectant spraying, 64 desks were sampled before and after electrostatic spraying without an intermediary conventional cleaning and disinfection step. Independent use improved general hygienic state of student desks ($t = 3.3$, $P = 0.001$). Mean pretest CFUs were 106.4 (SD 94.5) and after electrostatic disinfectant spraying mean CFUs decreased to 62.9 (SD 87.1) (Figure 2).

The differential effectiveness of conventional cleaning and disinfection and electrostatic disinfectant spray procedures when used independently was examined. Both cleaning and disinfection methods, when used independently, were effective in decontaminating student desks ($F = 23.5$, $P < 0.0001$); however, no difference in effectiveness was found between the two methods ($F = 0.88$, $P = 0.35$) (Figure 2).

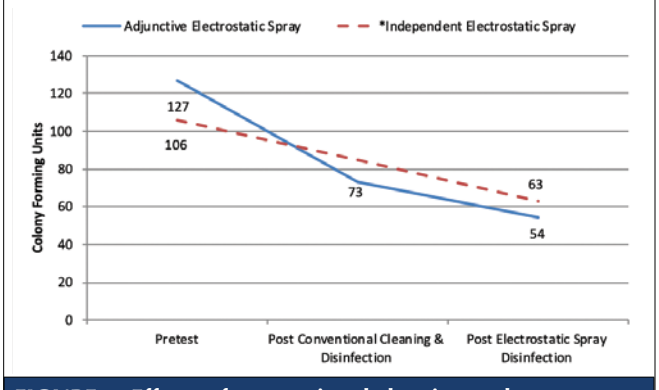


FIGURE 2: Effects of conventional cleaning and disinfection and electrostatic disinfectant spraying on general hygienic state

***No intervening conventional cleaning and disinfection step. Adjunctive Electrostatic Spray N = 36; Independent Electrostatic Spray N = 64.**

DISCUSSION

Student desks were found to be contaminated with viable microbes before cleaning and disinfection were conducted. This highlights the need for effective cleaning and disinfection of student desks [1,2]. Efficacious cleaning and disinfection would help to prevent the spread of infectious illnesses such as colds, pharyngitis, influenza, and intestinal ailments amongst students, teachers, and their families and community [1-3].

The results indicated conventional cleaning and disinfection procedures were effective in reducing viable microbes on student desktops. There was an additive disinfection effect when electrostatic spray disinfection followed conventional cleaning and disinfection. In schools where electrostatic disinfectant spraying was conducted without an intervening conventional cleaning and disinfection step, levels of viable microbes were decreased. Electrostatic spray disinfection technology increased general hygienic state when used independently and when used in conjunction with conventional cleaning and disinfection procedures.

When the independent effectiveness of conventional cleaning procedures and electrostatic spray were compared, no differences were found. This was for a single application and it is thought multiple episodes of electrostatic spray disinfection without intervening wiping would result in a buildup of debris on desks that would promote the growth of pathogens and reduce the effectiveness of electrostatic disinfectant spraying over time. Electrostatic spray disinfection technology is not recommended as a replacement for conventional cleaning and disinfection, rather as an adjunctive disinfection intervention. Electrostatic disinfectant spray use might be especially beneficial during influenza and other infectious outbreaks in schools to increase the frequency of disinfection. The cleaning and disinfection of healthcare settings may be more effective with the adjunctive use of electrostatic disinfectant spraying. The use of electrostatic spray disinfection technology in healthcare settings needs to be rigorously evaluated before being implemented.

In the present study, viral loads were not directly assessed as this would have been prohibitively expensive. Bacteria and fungi are generally hardier than viruses and improved hygienic state can be considered indicative of reduced viral loads [3]. RODAC plate testing, while less expensive than viral testing, was costly and limited both the number of desks that could be assessed, and the ability to examine

differences between student grade levels and conventional cleaning practices. Issues associated with access make it difficult to conduct such research in K-12 schools. Schools are cautious with regard to student safety and one school board withdrew due to concerns about potential custodian union issues. Interestingly, in general, custodians seemed to be pleased there was interest in school cleaning and disinfection practices.

School administrators and custodial managers have the responsibility to prevent and control infectious diseases in schools and to protect students, teachers, and the public by ensuring the most effective cleaning and disinfection practices are used. A first step would be to assess pathogen types and levels in schools. The next step would be to rigorously evaluate current cleaning and disinfection practices: Equipment, detergents and disinfectants, cleaning schedules, and staff training. This research initiative, in conjunction with an extensive literature review and lab investigations would aid in the development of a best practices cleaning and disinfection program for schools. In Ontario, the Provincial Infectious Diseases Advisory Committee developed an evidence-based, best-practice document for cleaning and disinfection in healthcare settings [10]. The development of effective and standardized cleaning and disinfection guidelines and standards for schools would have both health and fiscal benefits. It is recommended the Ontario ministries of Education and Health develop evidence-based best practices for cleaning and disinfection in schools.

CONCLUSION

When used independently, both conventional cleaning and disinfection and electrostatic disinfectant spraying were successful in disinfecting student desks. Electrostatic disinfectant spraying further improved hygienic state when conducted after conventional cleaning and disinfection procedures.

REFERENCES

1. Bright KR, Boone SA, Gerba CP (2009). Occurrence of Bacteria and Viruses on Elementary Classroom Surfaces and the Potential Role of Classroom Hygiene in the Spread of Infectious Diseases. *Journal of School Nursing*, 26, 33-41.
2. Kwan SE, Shaughnessy RJ, Hegarty B, Haverinen-Shaughnessy U, Peccia J (2018). The reestablishment of microbial communities after surface cleaning in schools. *Journal of Applied Microbiology*, 125, 897-906.
3. Kramer A, Schwebke I, Kampf G. (2006). How long do nosocomial pathogens persist on inanimate surfaces? A systematic review. *BMC Infectious Diseases*, 6, 130. DOI: 10.1186/1471-2334-6-130
4. Sattar, S.A. (2010). Promises and pitfalls of recent advances in chemical means of preventing the spread of nosocomial infections by environmental surfaces. *American Journal of Infection Control*, 38, S34-40.
5. Siani H, Wesgate R, Maillard JY. (2018). Impact of antimicrobial wipes compared with hypochlorite solution on environmental surface contamination in a health care setting: A double-crossover study. *Am J Infect Control*, 46, 1180-1187.
6. Bolton SL, Kotwal G, Harrison MA, Law SE, Harrison JA, Cannon JL. (2013). Sanitizer efficacy against murine norovirus, a surrogate for human norovirus, on stainless steel surfaces when using three application methods. *Applied and Environmental Microbiology,* 79,1368-77.
7. Boyce JM. (2016). Modern technologies for improving cleaning and disinfection of environmental surfaces in hospitals. *Antimicrobial Resistance and Infection Control*, 5,10.
8. "Clorox Commercial Solutions Clorox Total 360 System and Solutions" Retrieved from: http://www.cloroxprofessional.ca/products/clorox-total-360-system/
9. Maturin L, Peeler JT, 2002. Chapter 3, Aerobic Plate Count, Bacteriological Analytical Manual Online, 8th ed. U.S.F.D.A., Center for Food Safety and Applied Nutrition. Retrieved from: https://www.fda.gov/food/foodscienceresearch/laboratorymethods/ucm063346.htm
10. Ontario Agency for Health Protection and Promotion, Provincial Infectious Diseases Advisory Committee. Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Health Care Settings. 3rd Edition. Toronto: Queen's Printer for Ontario; 2018. Retrieved from: https://www.publichealthontario.ca/en/eRepository/Best_Practices_Environmental_Cleaning.pdf

COVID-19: Are you prepared for the next emerging disease?

Natasha Salt BSc, BASc, CPHI(C), CIC

Sunnybrook Health Sciences Centre, Toronto, ON, Canada
natasha.salt@sunnybrook.ca

The role of an infection control preventionist (ICP) has never been as diverse as it is today. While ICPs have been involved in emergency management since the 1990s, a formal role was first conceived in 2005 when an all-hazards approach was embraced by the Association for Professionals in Infection Control and Epidemiology [1]. ICPs play an important role in emergency preparedness and management for: emerging diseases, pandemics, bioterrorism attacks, natural disasters and manmade mass casualties. The SARS-CoV-2 outbreak in China has provided a burning platform for activating internal incident management systems (IMS), enhancing cross-sector planning, re-examining existing pandemic plans, optimizing communication pathways, and gearing up resources and training with ICPs leading the incident command.

Collaborating with Emergency Preparedness/Management (EP/M) is vital to responding to emerging diseases. Through established processes, they are involved in activating the IMS, which can direct important resources to the planning table. The IMS structure provides a standardized organizational response that uses common functions, processes and terminology consistent throughout all partners in the healthcare system [2]. Once the Health Emergency Operations Centre (HEOC) is activated, stakeholders such as communications, occupational health and safety, logistics, operations, finance/administrative and planning can be added as needed since the system is modular and adaptable to current needs. Regular structured meetings with definitive action items improve accountabilities and prioritize needs.

In Ontario, the severe acute respiratory syndrome (SARS) commission report revealed that the health system was working in silos [3]. Collaboration and clear communication during crisis are imperative to an effective response. Hospitals must reach out to their partners to ensure a consistent and evidence-based approach to implementing infection control strategies. In addition, sharing resources not only promotes consistency but also strengthens the entire system so that response efforts are distributed and local planning can be accelerated. Leaders must leverage technology such as webinars, GoToMeeting™ or teleconferencing to connect frequently and discuss operational opportunities and challenges they are facing.

Internal communication must also be clear and transparent. The SARS commission report identified weaknesses in internal collaboration between staff, infection prevention and control, occupational health and safety (OH&S) and the Ministry of Labour [3]. These networks should now be clearly developed and optimized during an emerging disease response. Providing resources via a centralized repository supports transparency and provides staff with a mechanism to connect with leadership to vocalize their questions. Additionally, ICPs should be well equipped with resources and education to support dissemination on patient care units. Redundancies to support this communication should also be considered by leveraging stakeholders such as EP/M and OH&S who can support a protracted response. Mechanisms to keep everyone abreast of the situation must be established early and plans to ensure their continuity should be considered.

An emerging disease is an opportunity to review existing pandemic, surge and business continuity plans. Though an established frequency to review these plans should be in place, it offers the leadership team an opportunity to review these plans to ensure they meet the needs of the organization and its partners at the time of the event. Supported by the IMS, it offers the team a chance to mobilize and prioritize resources in order to support response efforts. Issues in areas such as logistics may be apparent in the early stages of an emerging disease where access to appropriate personal protective equipment is limited due to escalating fear, hoarding and theft. Identifying strategies to mitigate shortages may require immediate implementation in order to prepare for events ahead. Updating plans to current realities will help to inform management strategies as well as inform future planning.

While the SARS-CoV-2 is an emerging pathogen that requires our immediate attention, it is important to not lose sight of the

Conflict of interest: None

Funding: None

https://doi.org/10.36584/CJIC.2020.005

fact that emergencies take shape in many forms. ICPs must be active members of the EP/M steering committees and help support planning efforts for all hazards. Participation in tabletop exercises, live exercises and real events help to inform after-action reports, which highlight lessons learned and opportunities for improvement. Infection prevention and control matters and has a role during all emergencies [4]. These routine efforts will help support an ICP's role in EP/M making a crisis more manageable when it presents itself.

Emerging diseases and pandemics pose the most significant threat to morbidity and mortality [1,4]. Engaging, developing and maintaining partnerships early, supports consistency in management, role clarification and communication. EP/M teams are catalysts that should be not only be leveraged during an emergency, but also in the preparedness phases of planning.

REFERENCES

1. Rebmann, T., Wagner, W., & Warye, K. (2009). APIC's role in emergency management: Proceedings of the 2008 APIC Emergency Preparedness Mini-Summit. *American Journal of Infection Control*, 37(4), 343–348. https://0-doi org.aupac.lib.athabascau.ca/10.1016/j.ajic.2008.11.012
2. Ontario Ministry of the Solicitor General. (2017). Incident management system. Retrieved from https://www.emergencymanagementontario.ca/english/emcommunity/ProvincialPrograms/IMS/ims_main.html
3. Ontario & Campbell, A. G. (2006). Spring of fear: The SARS Commission final report. Toronto: SARS Commission.
4. Rebmann, T. (2009). APIC State-of-the-Art Report: The role of the infection preventionist in emergency management. *American Journal of Infection Control*, 37(4), 271–281. https://0-doi-org.aupac.lib.athabascau.ca/10.1016/j.ajic.2008.12.002

CALL FOR PAPERS

The *Canadian Journal of Infection Control* is a leading international peer-reviewed journal providing a platform for knowledge transfer and academic discourse in the field of infection prevention and control and hospital epidemiology. The journal invites submission of manuscripts outlining original research that examines, informs, and advances this professional field.

Authors should follow the content and format recommendations as outlined in the journal's Guidelines for Authors (**https://ipac-canada.org/canadian-journal-of-infection-control-3.php**). Manuscripts are accepted in English and French and should be submitted electronically by emailing all materials to the attention of:

Victoria Williams, Editor-in-Chief
Canadian Journal of Infection Control
editor-in-chief@ipac-canada.org

A signed copy of IPAC Canada's Publisher-Author agreement must be received before a manuscript will be published. The agreement is available at **https://ipac-canada.org/canadian-journal-of-infection-control-3.php**. Please note that there is an approximate three- to four-month timeline between receipt of manuscript, peer review, editing, and publication. The *Canadian Journal of Infection Control* is a quarterly publication indexed by the Cumulative Index to Nursing and Allied Health Literature (CINAHL)/EBSCO, SilverPlatter Information, Inc. and CrossRef.

ipac pci
Infection Prevention and Control Canada
Prévention et contrôle des infections Canada

OUR CONCERN FOR THE ENVIRONMENT IS MORE THAN JUST TALK

As we continue to deliver valuable information through the pages of this magazine, in a printed format that is appealing, reader-friendly and not lost in the proliferation of electronic messages that are bombarding our senses, we are also well aware of the need to be respectful of our environment. That is why we are committed to publishing the magazine in the most environmentally-friendly process possible. Here is what we mean:

- We use lighter publication stock that consists of recycled paper. This paper has been certified to meet the environmental and social standards of the Forest Stewardship CouncilTM (FSC®) and comes from responsibly managed forests, and verified recycled sources making this a RENEWABLE and SUSTAINABLE resource.
- Our computer-to-plate technology reduces the amount of chemistry required to create plates for the printing process. The resulting chemistry is neutralized to the extent that it can be safely discharged to the drain.
- We use vegetable oil-based inks to print the magazine. This means that we are not using resource-depleting petroleum-based ink products and that the subsequent recycling of the paper in this magazine is much more environment friendly.
- During the printing process, we use a solvent recycling system that separates the water from the recovered solvents and leaves only about 5% residue. This results in reduced solvent usage, handling and hazardous hauling.
- We ensure that an efficient recycling program is used for all printing plates and all waste paper.
- Within the pages of each issue, we actively encourage our readers to REUSE and RECYCLE.
- In order to reduce our carbon footprint on the planet, we utilize a carbon offset program in conjunction with any air travel we undertake related to our publishing responsibilities for the magazine.

SO ENJOY THIS MAGAZINE...AND KEEP THINKING GREEN.

GOWNS

SHOE COVERS

MASKS

N95

HEAD COVERS

GLOVES

MASKS WITH SHIELD

DISINFECTING WIPES

HAND SANITIZER

IT IS EASIER TO PRACTICE IPAC WHEN ALL PPE ARE WITHIN REACH!

Hygiene

Also excellent systems for COVID-19 screening clinics

Mobile

Made for daily care & Isolation.

Wall-Mounted

Dispensers for all types of PPE. Also sold separately.

NEW! Clip Unclip PLUS
PPE DISTRIBUTION SYSTEMS

Launch of our brand new Mobile and Wall-Mounted PPE distribution systems.

Configure for daily care and instantly customize your configuration for IPAC conditions on a daily basis.

www.medicacces.ca

MÉDIC ACCÈS

Manufacturer of Personal Protective Equipment Dispensers
Scalable and Adaptable Modular Systems.

Together, we do amazing things every day

We're leaders in our work. We support patients, their families, staff, physicians and volunteers across the continuum of care.

Our Infection Prevention and Control program is one of a kind. With province-wide surveillance, hand hygiene initiatives, medical device reprocessing quality reviews, and various education and best practice resources, we work collaboratively to integrate IPC principles into all aspects of patient care.

Learn more at ahs.ca/ipc.

Alberta Health Services

Infection Prevention & Control

Healthy Albertans.
Healthy Communities.
Together.

Canada's Top 100 Employers 2018

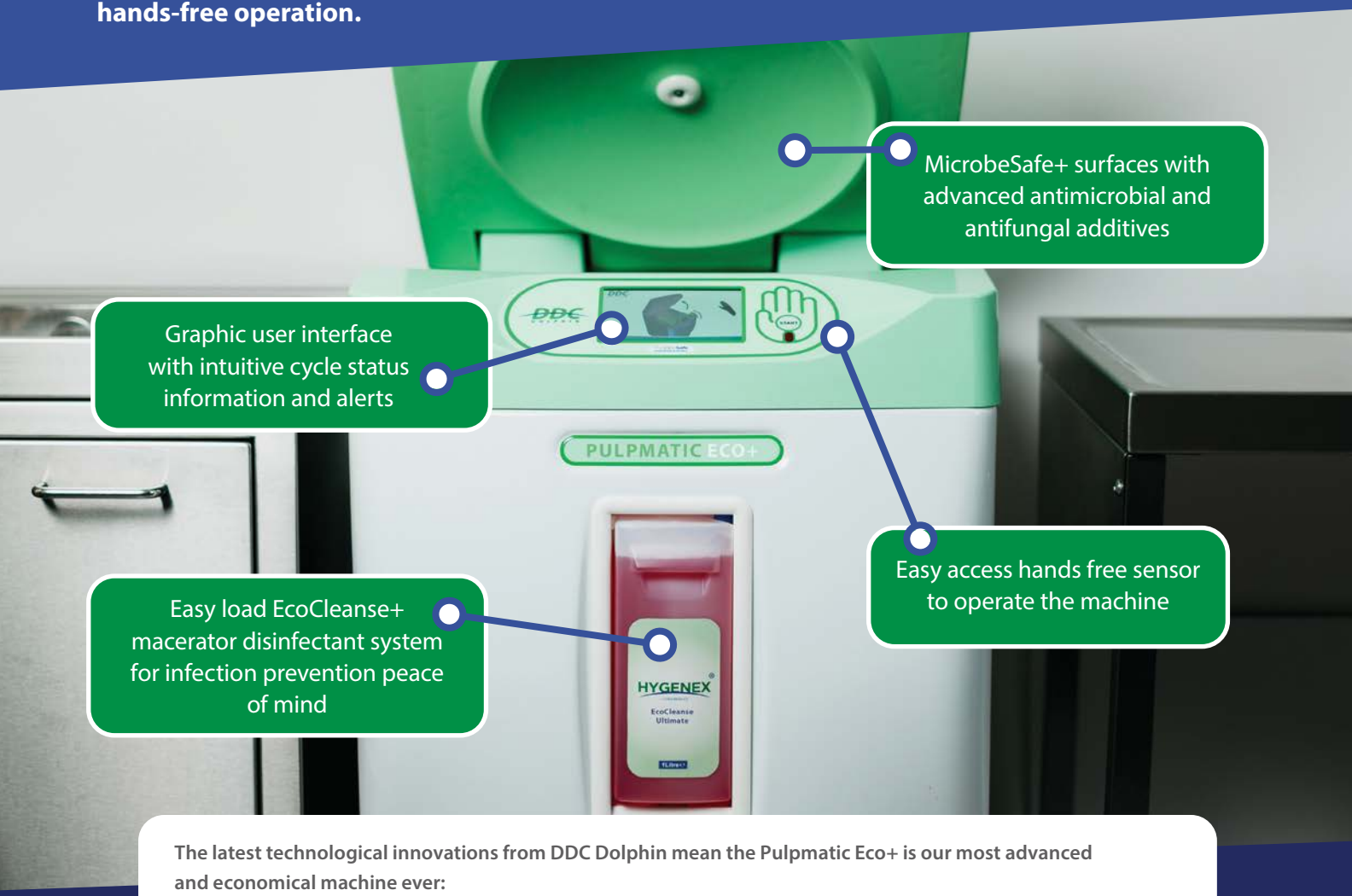
Alberta's TOP 70 EMPLOYERS 2017

Canada's Top Employers for Young People 2018

The next generation
Pulpmatic from DDC Dolphin

The brand-new Pulpmatic Eco+ is the most environmentally friendly, economical and hygienic macerator on the market.

Featuring enhanced chemical dosing, powerful antimicrobial surfaces and fully hands-free operation.



The latest technological innovations from DDC Dolphin mean the Pulpmatic Eco+ is our most advanced and economical machine ever:

- Macerates up to 4 pulp items per cycle
- Reduced cycle time
- 50% less water consumption
- Lower energy usage
- Finer maceration to eradicate drain blockages
- Robust and hygienic stainless steel cabinet
- Animated user instructions to minimise user errors and help resolve faults
- Simplified installation for fitting in various environments

Want to know more about how the Pulpmatic Eco+ can prevent infection in your facility?

Register your interest today.

+44 (0) 01202 731555 **info@ddcdolphin.com** **www.ddcdolphin.com**

Keep it Clean™

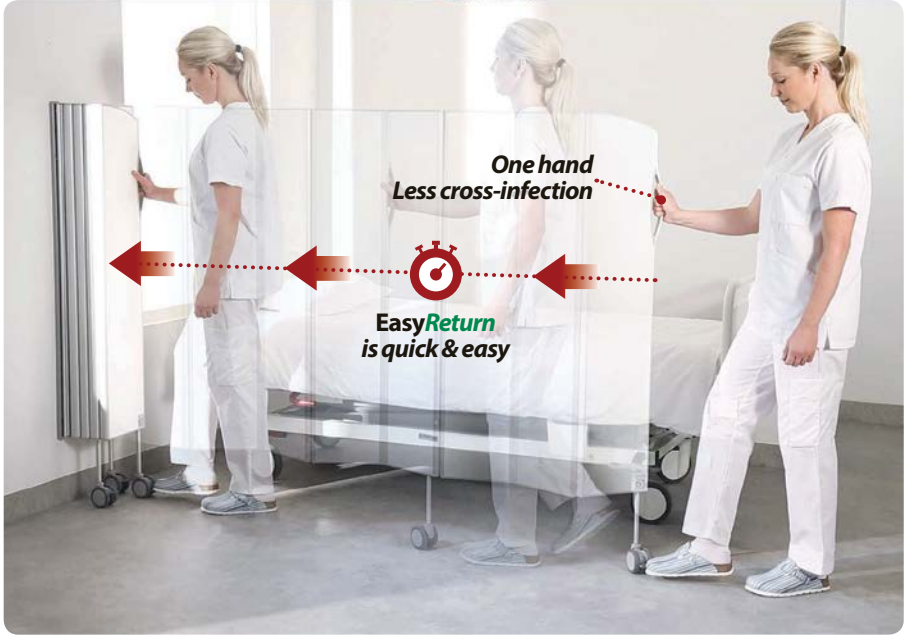
2 easy and important facts to consider **when replacing privacy curtains with screens**

1. Easy*Clean*

Optimises infection prevention

The Silentia Screen System meets strict hygiene requirements.

- All surfaces are smooth and easy to reach and disinfect
- All surfaces withstand disinfectants used in today's care situations
- The wheels can be removed and machine washed
- Can be cleaned immeadiately unlike curtains. Faster room turnaround.



2. Easy*Return*

Quick and easy to fold back

Lightweight material and a Built-In Memory for an easy and quick return to its original position.

The One Touch Point Handle means:

- No need for hands to touch other surfaces when folding the screen
- Only one hand needs to be used which reduces cross-infection

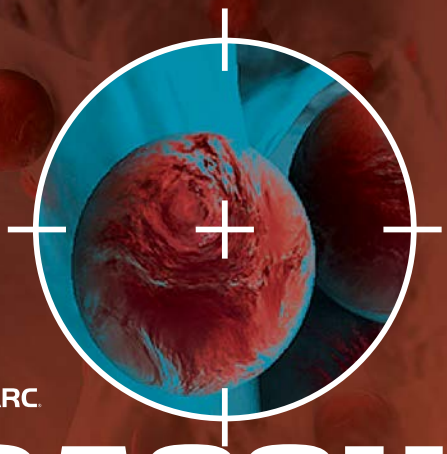
Contact us for a free demonstration.

Together we will help you find the right solution for your healthcare environment.

Cornerstone Medical Inc. brings you the industry's best products from companies who focus their R&D to meet healthcare's evolving needs.

Cornerstone Medical Inc., 10-889 Barton Street, Stoney Creek, ON L8E 5V1
T 905-945-2522 or 1-800-652-3895 | F 905-945-5611 | E info@cornerstone-medical.com
www.cornerstone-medical.com

FIRST AND ONLY ***HEALTH CANADA-REGISTERED*** *PRODUCT*
AGAINST BIOFILMS



SANI MARC

BIOASSURE™ MC

DIN 02456435

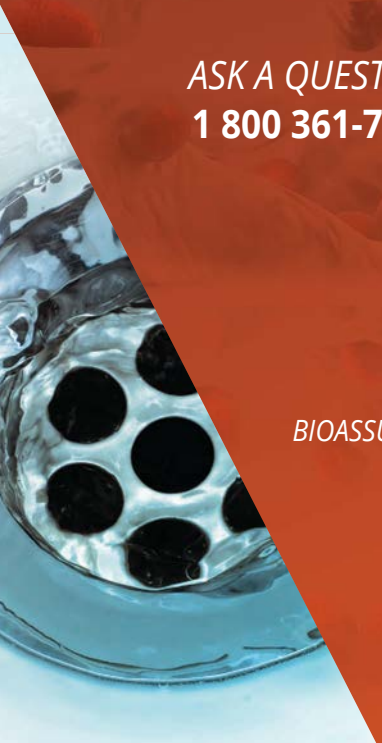
KILLS BACTERIA IN **BIOFILMS** IN **DRAINS** IN 5 MINUTES
KILLS AND REDUCES THE SPREAD OF **SUPERBUGS**

ASK A QUESTION
1 800 361-7691

GET MORE INFO
sanimarc.com/bioassure

ACCESS OUR WHITE PAPER ON BIOASSURE EFFICACY

ASK FOR A DEMO
sales@sanimarc.com



BIOASSURE products are distributed by Wood Wyant, a subsidiary of Sani Marc Group.

WOOD WYANT
Subsidiary of Sani Marc Group

Diversey™

Thinking infection prevention? Take the floor-to-ceiling approach.

Oxivir® Tb Wipes

One-step, one-wipe, one-minute cleaning and disinfection of hard surfaces. Active ingredient breaks down into oxygen and water after use. Gentle on people and assets.

FOR DAILY DISINFECTION

MoonBeam™3

destroys pathogens that cause HAIs in as little as 3 minutes. Individually adjustable light arms deliver a powerful UV-C light dose to disinfect high-touch surfaces.

FOR ADDED ASSURANCE

Titan™ Tabs

Sporicidal Disinfectant kills *C. diff* spores in just 4 minutes. Non-bleach formula, effective against biofilms. Compact, easy-to-handle tablets. For floors and hard, non-porous surfaces.

FOR SPECIALTY DISINFECTION

SOLUTIONS DESIGNED FOR HEALTHCARE™

See all the infection prevention solutions at **sdfhc.com**

Contact your local Sales Representative for more information:
800-665-4831 or
Info.Canada@arjo.com.

A full range of solutions to help increase efficiency and control infections

With a wide range of high-quality equipment, we can help you develop an efficient environment as a key component of your infection-control strategy.

Maxi Sky®2 Infection Control
Ceiling lift systems

Tornado®
Disinfection flusher system

Wipeable standing clip sling
Standing and raising aid sling

Flexibility and choice to support your infection-control strategy

- Range of bedpan disinfectors
- C. difficile solutions
- Hydrosound™ bathing
- Medical beds designed for easy decontamination
- Disposable slings
- Patient-specific slider sheets
- Clinical education

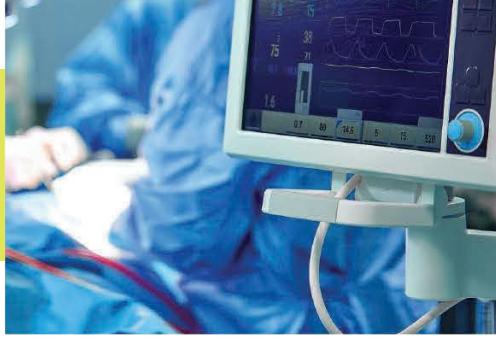
Arjo_HYG_Disinfection_CJIC_Ad.01.0.CA.EN

Arjo Canada Inc. · 90 Matheson Blvd West, Suite 350 · Mississauga, ON, L5R 3R3 · 1-800-665-4831 · www.arjo.com

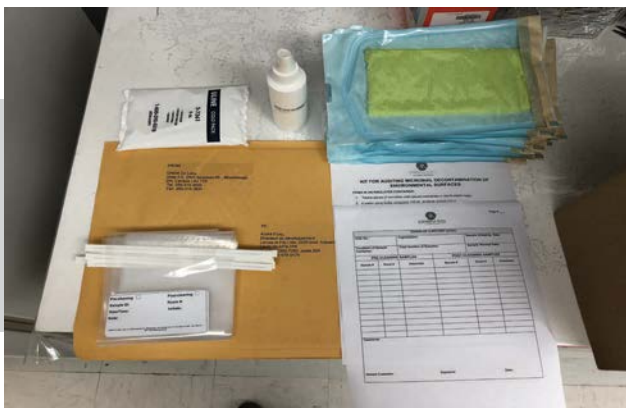
arjo
with people in mind

PROCESS CLEANING SOLUTIONS
Bringing Science to the Art of Cleaning

KIT FOR AUDITING MICROBIAL DECONTAMINATION OF ENVIRONMENTAL SURFACES



CREM Co's use of **PCS patented process applied for auditing kit** can sample environmental surfaces **as large as 30x60 cm (1x2 feet)** in healthcare facilities with **>80% recovery of the microbial burden.** The method is simple, economical and quantitative. The spray-and-wipe procedure using a microfiber cloth **permits wiping of smooth and uneven surfaces** while also **recovering microbes in even dried surface biofilms.** The kit can assess the presence of bacteria and fungi/unit surface area sampled. **The turnover time of the method remains similar to that of other available methods.**



CREM CO
For a Safer Tomorrow

For more information
Toll Free: 1-855-463-3310
www.cremco.ca

NEUTRAL PH PCS 250 OXIDIZING DISINFECTANT/ DISINFECTANT CLEANER

Use to clean frequently touched surfaces.
Apply to surface and wipe dry.

DIN: 02314843

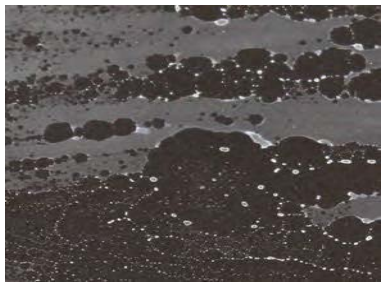
- **SAFE**
- **EFFECTIVE**
- **ENVIRONMENTALLY RESPONSIBLE**
- **CLEANING WITHOUT TRANSFERRING PATHOGENS•**

*CLEANING WITHOUT TRANSFERRING INFECTIOUS DOSE OF PATHOGENS

“Disinfectant Residues Should Be Removed”

[“Widely Used Benzalkonium Chloride Disinfectants Can Promote Antibiotic Resistance”]

No Residue



Residue

Neutral pH PCS 250 Oxidizing Disinfectant/Disinfectant Cleaner

Use to clean frequently touched surfaces.
Apply to surface and wipe dry with microfibre cloth or other clean dry absorbent cloth.

Cleaning

- PCS 250 Oxidizing Disinfectant/Disinfectant Cleaner
- Apply with pre moistened wipe and wipe dry with PCS microfibre cloth

Versus

- 1.4 % Hydrogen Peroxide wipes
- Quaternary disinfecting wipe containing alcohol
- Cleaning and disinfecting one wipe used to clean and a second wipe applied to disinfect

CREM CO Quantitative Carrier Test QCT-3

Vegetative Bacteria (S. aureus and S. marcescens)
Average CFU per square centimetre

	CFU/cm2			Chemical Residue	Average Percent
Product	Control	After Wiping	Transfer		Reduction
PCS 250	**26,900**	**0.25**	**0**	**NO**	**99.999**
1.4% HP	**14,000**	**1.27**	**0**	**YES**	**99.991**
QUAT/ALC	**34,400**	**2.54**	**0**	**YES**	**99.993**

C. difficile spores
Average CFU per square centimetre

	CFU/cm2			Chemical Residue	Average Percent
Product	Control	After Wiping	Transfer		Reduction
PCS 250	**3330**	**15.15**	**2.44**	**NO**	**99.53**
1.4% HP	**1150**	**14.33**	**15.3**	**YES**	**98.75**
QUAT/ALC	**750**	**263**	**161**	**YES**	**60.39**

This journal would not be possible without the advertising support of the following companies and organizations. Please think of them when you require a product or service. You can also access the electronic version at *www.ipac-canada.org*.

Company	Page	Phone	Web Site
Alberta Health Services	44		www.ahs.ca/ipc
AMG Medical Inc.	IBC	800-363-2381	www.amgmedical.com
Arjo Canada Inc.	49	800-665-4831	www.arjo.com
CardioMed	8	705-328-2518	www.cardiomed.com
Cintas	Insert		www.cintas.com
Clorox Healthcare	2, 3	866-789-4973	www.cloroxhealthcare.ca
Cornerstone Medical Inc.	46	800-652-3895	www.cornerstone-medical.com
DDC Dolphin	45	44 (0) 01202 731555	www.ddcdolphin.com
Diversey	5, 48	800-668-7171	www.sdfhc.com
Glo Germ Company	8	435-259-5931	www.glogerm.com
GOJO Canada, Inc.	10	800-321-9647	www.GOJOCanada.ca
Hygie Canada	9	866-588-2221	www.hygie.com
Medco Equipment	7	800-717-3626	www.medcoequipment.com
Médic Accès	43	877-782--3017	www.medicacces.ca
Phoenix Airmid	12	905-469-4253	www.phoenixairmid.com
Prescientx	6	519-749-5267	www.prescientx.com
Process Cleaning Solutions	50, 51	877-745-7277	www.processcleaningsolutions.com
Stryker Canada	15	800-323-2220	www.sageproducts.com
Sani Marc Group	47	800-361-7691	www.sanimarc.com
SC Johnson Professional CA Inc.	54	519-443-8697	www.debmed.ca
Tagg Design Inc.	40	416-249-2220	www.taggcleanhands.com
The Stevens Company Limited	11	800-268-0184	www.stevens.ca
TOMI Environmental Solutions, Inc.	4	800-525-1698	www.tomimist.com
Vernacare Canada Inc.	1	800-268-2422	www.vernacare.com
Virox Technologies Inc.	IFC	800-387-7578	www.virox.com

Same **powerful sporicide** now more versatile

INTRODUCING THE NEW

nocospray®

The **New Nocospray Disinfection System** can disinfect **twice the space** and comes equipped with onboard **data tracking** to help you achieve even better results with the push of a button.

Find out more and schedule your on-site demonstration in time for Capital Budget season.

Call 1-800-363-2381 or visit us at www.medprodefense.com

MedPro DEFENSE®

Rev 1119

SC Johnson PROFESSIONAL®
A Family Company™

Protecting the

PATIENT, CAREGIVER, AND THE HEALTHCARE ENVIRONMENT

The SC Johnson Professional range unites the DebMed Hand Hygiene Monitoring System with hand hygiene products formulated to meet the strict standards of healthcare facilities and help to:

- REDUCE INFECTIONS
- DECREASE COSTS
- INCREASE PATIENT SAFETY
- PROVIDE ACTIONABLE COMPLIANCE REPORTS

TO LEARN MORE VISIT **https://info.scjp.com/healthcare**