

Practical Management of Norovirus Infected Patients in Norovirus Settings

Dr. Taranisia MacCannell , Centers for Disease Control

Teleclass broadcast sponsored by Virox Technologies (www.virox.com)

Practical Management of Norovirus Infected Patients in Healthcare Settings



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Hosted by **Russell Olmsted**
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National Center for Emerging and Zoonotic Infectious Diseases
Division of Healthcare Quality Promotion

Background

- Norovirus is the most common cause of acute gastroenteritis outbreaks in community and healthcare settings (21 million infections / yr in the US)
- Symptoms of norovirus infection include sudden onset non-bloody diarrhea and vomiting primarily, but can also include nausea, cramps, malaise, fever
- Symptoms are usually self-limiting and illness duration can range from 2-5 days

Almost the perfect pathogen....


- Inoculating dose is very small (as little as 10-100 virus), and persisting immunity after illness is limited even among healthy persons (~4-6 months)
- Short incubation period (typically 24-48 hrs)
- Can survive in a multitude of environments/ temperatures and for extended periods: food, hands, surfaces
- Most household disinfectants have little or no activity against norovirus
- Difficult to study *in vitro* as human strains have not been successfully grown in cell culture

Norovirus: its history, and its epidemiology

- **A (very) Brief History:**
 - First identified in 1972 using electron microscopy as the cause of what was previously known as Winter Vomiting disease
 - Previously thought to only affect school aged children and adults
 - Virus was originally named "Norwalk virus" after a school outbreak in Norwalk, OH in 1968
- **Epidemiology**
 - Major cause of viral gastroenteritis worldwide and may cause up to 50% of all acute gastroenteritis outbreaks
 - Seroprevalence studies show 80-90% exposure by young adulthood
 - Major human strains comprise Genogroup I and II, with Genogroup II.4 predominant in >74% outbreaks

Modes of Norovirus Transmission in Healthcare

- **Primary Mode: Contact person-to-person transmission via fecal-oral route**
 - Direct and indirect (via fomites) transmission
- **Other Modes of Transmission:**
 - Some evidence to suggest short range aerosols may propagate virus
 - E.g., Projectile vomiting
 - Intrinsic / extrinsic contamination of foods, water



Costs of Managing Norovirus Outbreaks in Healthcare

- **Estimates for norovirus infection:**
 - United States, 2004 – \$650,000
 - 355 cases, 17 weeks
 - Switzerland, 2003 – \$40, 675
 - 16 cases, 2 weeks
 - United Kingdom, 2002/03 - \$1 million per 1000 beds, overall \$184 million to English National Health Service
 - 3 health systems
 - >3400 cases in 227 outbreaks, 2 years
- Costs included lost revenue (closures), plus measures such as healthcare personnel, sick time (lost productivity), environmental cleaning, isolation precautions

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Challenges with Norovirus in Healthcare Settings

- Institutional settings (e.g. long term care facilities , acute care) report >50% of reported outbreaks even though many associate it with outbreaks on cruise liners and banquets
- Typically short duration illness, can lead to prolonged lengths of stay, severe dehydration / electrolyte imbalances, renal insufficiency
- Outbreaks can be protracted and very difficult to control with broad infectivity to almost any population and low infectious dose

The new HICPAC Guideline Development Process and Format

- **Highlights to changes in guideline process:**
 - Create the processes necessary to rapidly develop and update guidelines to allow an appropriate response to emerging needs and new scientific evidence;
 - Address the key clinical questions of infection preventionists and providers in a targeted way;
 - Use the best available evidence to answer those questions efficiently;
 - Provide transparent recommendations without bias;
 - Prioritize recommendations for implementation.

Craig A. Umscheid, MD, MSCE¹; Rajender K. Agarwal, MD, MPH¹; and Patrick J. Brennan, MD¹; for the Healthcare Infection Control Practices Advisory Committee (HICPAC).
http://www.cdc.gov/hicpac/pdf/guidelines/2009-10-29HICPAC_GuidelineMethodsFINAL.pdf

Evaluating the Evidence

- **CDC / HICPAC Guidelines recently adopted the GRADE Methodology for evidence based recommendations**
- **Strength of the Recommendations depend on:**
 - Type of evidence (RCT, systematic reviews, observational studies, descriptive reports)
 - Balancing known and unknown risks and benefits of recommendations e.g., net benefit > net harm
 - Quality of analysis and reported evidence

GRADE = Grades of Recommendation, Assessment, Development, and Evaluation

Levels of Evidence for Recommendations

| HICPAC Categorization Scheme for Recommendations | |
|--|---|
| Category IA | A strong recommendation supported by high to moderate quality evidence suggesting net clinical benefits or harms. |
| Category IB | A strong recommendation supported by low-quality evidence suggesting net clinical benefits or harms, or an accepted practice (e.g., aseptic technique) supported by low to very low-quality evidence. |
| Category IC | A strong recommendation required by state or federal regulation. |
| Category II | A weak recommendation supported by any quality evidence suggesting a tradeoff between clinical benefits and harms. |
| Recommendation for further research | An unresolved issue for which there is low to very low-quality evidence with uncertain tradeoffs between benefits and harms. |

Guideline Key Questions

1. What person, virus or environmental characteristics increase or decrease the risk of norovirus infection in healthcare settings?
2. What are the best methods to identify a norovirus outbreak in healthcare settings?
3. What interventions best prevent or contain norovirus outbreaks in healthcare settings?

<http://www.cdc.gov/hicpac/pdf/norovirus/Norovirus-Guideline-2011.pdf>

Infect Control Hosp Epidemiol. 2011 Oct;32(10):939-69.



Key Infection Control Measures

PATIENT COHORTING AND ISOLATION PRECAUTIONS

- Avoid exposure to vomitus or diarrhea. Place patients on Contact Precautions in a single occupancy room if they have symptoms consistent with norovirus gastroenteritis. (Category IB)
- When patients with norovirus gastroenteritis cannot be accommodated in single occupancy rooms, efforts should be made to separate them from asymptomatic patients ...may include placing patients in multi-occupancy rooms, or designating patient care areas or contiguous sections within a facility for patient cohorts. (Category IB)

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Practical Challenges with Isolation and Cohorting

- ❑ Isolation rooms may not be the typical single room – single patient bathroom, particularly in LTCF
- ❑ Should you move patients to cohort them?
- ❑ Isolating non-compliant populations is challenging and may require additional built-environment controls (e.g. closing sections)
- ❑ Cohorting among like-sex and like-disease status patients can be an issue, and may not provide dedicated toilets or commodes

Key Infection Control Measures

HAND HYGIENE

- ❑ During outbreaks, use soap and water for hand hygiene after providing care or having contact with patients suspected or confirmed with norovirus gastroenteritis. (Category IB)
- ❑ For all other hand hygiene indications (e.g., before having contact with norovirus patients) refer to the 2002 HICPAC Guideline for Hand Hygiene in Health-Care Settings, which includes the indications for use of FDA-compliant alcohol based hand sanitizer. (Category IB)
- ❑ Consider ethanol-based hand sanitizers (60-95%) as the preferred active agent for hand hygiene compared to other alcohol or non-alcohol based hand sanitizer products during outbreaks of norovirus gastroenteritis. (Category II)

Interpreting the Use of Soap & Water vs. Alcohol Based Hand Sanitizer during Norovirus Outbreaks

- ❑ **When to use hand sanitizer for hand hygiene?**
 - Before caring for diarrheal patients
 - Before and after care of patients without suspected norovirus patients
 - When hands have not been visibly contaminated



- ❑ **When to preferentially use soap and water for hand hygiene?**
 - After caring for any diarrheal patient or those suspected/confirmed with norovirus (even when gloves are worn)
 - When hands have been visibly contaminated
- ❑ Data inconclusive: neither method is more efficacious for norovirus

Key Infection Control Measures

PATIENT TRANSFER AND WARD CLOSURE

- ❑ Consider limiting transfers to those for which the receiving facility is able to maintain Contact Precautions; otherwise, it may be prudent to *postpone* transfers until patients no longer require Contact Precautions.
- During outbreaks, medically suitable individuals recovering from norovirus gastroenteritis can be discharged to their place of residence. (Category II)



Practical Issues with Transferring / Discharging Symptomatic Patients

- ❑ Receiving facilities or clinical areas may be reticent to accept a patient requiring isolation resources
- ❑ Challenges to discharging patient to residential environments (e.g., home, assisted living) where environmental cleaning not as frequent, community events, unrestricted visitors or guests



Key Infection Control Measures

DIAGNOSTICS

- ❑ In the absence of clinical laboratory diagnostics or in the case of delay in obtaining laboratory results, use Kaplan's clinical and epidemiologic criteria to identify a norovirus gastroenteritis outbreak. (Category IA)

KAPLAN'S CRITERIA (c 1982)

- 1) Vomiting in more than half of symptomatic cases, or
- 2) Mean (or median) incubation period of 24 to 48 hours, or
- 3) Mean (or median) duration of illness of 12 to 60 hours, or
- 4) No bacterial pathogen isolated in stool culture

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The Diagnostic Challenge in Confirming Norovirus

- **Issues**
 - Often norovirus not on clinician differential diagnoses (vs. *C. difficile*) and order for EIA or PCR not done
 - Specimens for norovirus should be taken during acute phase of illness (<3 days of onset)
 - Some patients only present with acute vomiting, lowering sensitivity of norovirus detection
 - Morbidity / mortality risk not high
 - Healthcare facilities may have criteria for batching specimens or only after an outbreak declared
 - Detection of norovirus is generally low in fecal / vomitus specimens
 - Diagnosis does not assist with treatment options

Validation of Kaplan's Criteria

- Turcios et al (2006) applied Kaplan's Criteria to 4050 known / unknown foodborne gastroenteritis outbreaks reported to CDC (1998-2000)
- Also tested a new measure of fever-to-vomiting and diarrhea-to-vomiting ratios
- Kaplan's Criteria demonstrated high specificity (99%) / moderate sensitivity (68%), PPV 97.1%
- Other ratios performed less well: specificity 90-97%, sensitivity 45-47%, PPV 55%

Key Infection Control Measures

ENVIRONMENTAL CLEANING

- Increase the frequency of cleaning and disinfection of patient care areas and frequently touched surfaces during outbreaks of norovirus gastroenteritis (Category IB)
- For example: increase ward/unit level cleaning to twice daily to maintain cleanliness, with frequently touched surfaces cleaned and disinfected three times daily using EPA-approved products for healthcare settings).

Key Infection Control Measures

- Clean and disinfect shared equipment between patients using EPA-registered products with label claims for use in healthcare. (Category IC)

Follow the manufacturer's recommendations for application and contact times. The EPA lists products with activity against norovirus (<http://www.epa.gov/oppad001/chemregindex.htm>).

List G: EPA's Registered Antimicrobial Products Effective Against Norovirus (Norwalk-like virus)
January 9, 2009



What do we mean by EPA-approved Disinfectants with Label Claims for Norovirus?

- *The fine print* – EPA regulates and approves disinfectants under FIFRA (e.g., antimicrobial pesticides), but no governing regulation over detergents / cleaning agents
- Disinfectants with specific label claims against norovirus must demonstrate multiple trials /dilutions of virucidal efficacy (>10⁴) against feline calicivirus (FCV)
- Products with labels specifying use in healthcare must demonstrate application, contact time instructions in these settings
 - Includes cleaner/disinfectant combination products

Environmental Cleaning/Disinfection Recommendations

- Clean and disinfect surfaces starting from the areas with a lower likelihood of norovirus contamination (e.g., tray tables, counter tops) to areas with highly contaminated surfaces (e.g., toilets, bathroom fixtures).

Change mop heads when a new bucket of cleaning solution is prepared, or after cleaning large spills of emesis or fecal material. (Category IB)

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Environmental Cleaning/Disinfection Recommendations

- Consider avoiding the use of upholstered furniture and rugs or carpets in patient care areas, as these objects are difficult to clean and disinfect completely.

If this option is not possible, immediately clean soilage, such as emesis or fecal material, from upholstery, using a manufacturer-approved cleaning agent or detergent. Opt for seating in patient-care areas that can withstand routine cleaning and disinfection. (Category II)

Environmental Cleaning/Disinfection Recommendations

- Consider steam cleaning of upholstered furniture in patient rooms upon discharge. Consult with manufacturer's recommendations for cleaning and disinfection of these items. Consider discarding items that cannot be appropriately cleaned/disinfected. (Category II)

Efficacy Data on Disinfectant Classes

- **Challenge in evaluating basic science data:**
 - Trials executed in the lab can use a variety of product formulations, many of which are considered off-label uses (concentration, contact times, etc)
 - Some products tested and reviewed for the CDC / HICPAC guideline were not registered for use in the US by the EPA
 - Use of different surrogate models, substrates
 - Many used a 3 log reduction as a benchmark (vs. complete inactivation, 4 log reduction set by EPA)
- Basic science studies showed most consistent performance with halogen compounds (e.g., hypochlorite (>1000ppm))

Cleaning and Disinfection Issues

- **Controlling the level of environmental contamination has several facets**
 - Cleaning and disinfecting equipment and surfaces
 - EPA-approved products WITH label claims for norovirus (feline calicivirus as a surrogate) and instructions for use in healthcare settings
 - Both cleaning and disinfection (e.g., contact time) steps outlined and followed
 - Addressing frequently touched surfaces
 - Defined as bed rails, toilet, over bed tray, IV poles/pump, etc.
 - Frequency of both unit/ward-level and isolation room cleaning and disinfection
 - Some studies supported increased frequencies (x2 or x 3 daily)

Environmental Cleaning/Disinfection Recommendations

- During outbreaks, change privacy curtains when they are visibly soiled and upon patient discharge or transfer. (Category IB)
- Handle soiled linens carefully, without agitating them, to avoid dispersal of virus. Use Standard Precautions, including the use of appropriate PPE (e.g., gloves and gowns). (Category IB)
- Double bagging, incineration, or modifications for laundering are not indicated for handling or processing soiled linen. (Category II)

Data Using Feline Calicivirus as a Surrogate Model for Human Norovirus

- **Issues:**
 - Human norovirus cannot be cultivated *in-vitro*
 - Main surrogate is feline calicivirus (FCV) but is a respiratory pathogen
 - Not as pH stable
 - May not be a suitable comparison to human norovirus physiochemical properties
- **Alternate surrogates?**
 - Murine norovirus seems to be a frontrunner (Cannon et al, 2006)
 - Hepatitis, pneumonia, nervous system pathogen BUT transmitted fecal-oral route
 - Wider spectrum of tolerances (e.g., pH, temp) than FCV



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Key Infection Control Measures

STAFF LEAVE AND POLICY

- Develop and adhere to sick leave policies for healthcare personnel who have symptoms consistent with norovirus infection. (Category IB)
- Exclude ill personnel from work for a minimum of 48 hours after the resolution of symptoms. Once personnel return to work, the importance of performing frequent hand hygiene should be reinforced, especially before and after each patient contact. (Category IB)
- Establish protocols for staff cohorting in the event of an outbreak of norovirus gastroenteritis. Ensure staff care for one patient cohort on their ward and do not move between patient cohorts (Category IB)
- Exclude non-essential personnel, students, volunteers from working in areas experiencing norovirus outbreaks (Category IB)


Practical Issues with Staff Leave During Norovirus Outbreaks

- Continuation of safe staffing levels on affected outbreak units / wards
- Lack of sufficient paid leave for individual ill personnel
- Issues with interpreting resolution of illness with the recommendation to wait an additional 48hrs+ after resolution of symptoms
- Duration of asymptomatic shedding of norovirus

Key Infection Control Measures

COMMUNICATION AND NOTIFICATION

- As with all outbreaks, notify appropriate local and state health departments, as required by state and local public health regulations, if an outbreak of norovirus gastroenteritis is suspected. (Category IC)



Process of Controlling Suspected Norovirus Outbreaks

- Like any outbreak, multi-faceted approach
- Key: **RAPID IDENTIFICATION and ACTION**
- **General Sequence**
 - Identify primary cases – epidemiological info (person, time, space)
 - Implementation of patient isolation / cohorting
 - Emphasis on personal hygiene practices: PPE and Hand Hygiene
 - Increased frequency and extent of environmental cleaning and disinfection
 - Early education and Communication among staff/patient/visitors

When primary infection control measures DON'T stop an outbreak...

- **Supplemental Infection Control Interventions**
 - From the HICPAC Guideline, typically Category II recommendations (modest evidence, unproven net benefit)
- **Consider –**
 - Suspending group activities
 - Extending isolation periods among at-risk patient populations
 - Unit / ward closure
 - Limited inter/intra-facility transfers

What Does the Evidence Show? Effective Strategies

- **Overall, the published evidence is descriptive / narrative in nature**
 - Difficult to determine contribution of any single intervention during outbreaks
 - Controlled studies not possible or ethical
- **Environmental studies demonstrate *in-vitro* benefits of certain disinfectants**
 - Difficult to extrapolate to real-world settings
 - How human norovirus strains respond?

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Components of Outbreak Control in Healthcare Settings

Interventions

- ✱ Patient cohorting and isolation precautions
- ✱ Hand hygiene
- ✱ Enhanced use of personal protective equipment
- ✱ Environmental cleaning
 - Patient transfer and ward closure
 - Indirect patient care: food handlers
 - Visitors

Infrastructure and Policy

- ✱ Staff leave / facility policies
- ✱ Education
 - Communication and Notification

Case Detection

- Active case finding
- Diagnostics

Identifying Gaps in the Current Literature

Host Contagiousness and Transmission

- Determine correlations between prolonged shedding of norovirus after symptoms have subsided and the likelihood of secondary transmission of norovirus infection.
- Determine the role of asymptomatic shedding (among recovered persons and carriers) in secondary transmission.

Identifying Gaps in the Current Literature

Environmental Issues

- Quantify the effectiveness of cleaning and disinfecting agents against norovirus or appropriate surrogates.
- Evaluate effectiveness and reliability of novel environmental disinfection strategies such as fogging, UV irradiation, vapor-phase hydrogen peroxides, and ozone mists to reduce norovirus contamination.

Identifying Gaps in the Current Literature

Hygiene and Infection Control

- Evaluate the effectiveness of FDA-compliant hand sanitizers against human norovirus or appropriate surrogates, including viral persistence after treatment with non-alcohol based products.
- Assess the benefits and impact of implementing Universal Gloving practices during outbreaks of norovirus gastroenteritis

Resources for Healthcare Settings: A Toolkit for Norovirus Outbreaks in Healthcare

- Links to the HICPAC Guidelines for the Management and Control of Norovirus Gastroenteritis Outbreaks in Healthcare Settings
- Key infection control recommendations
- Poster template
- General process measures to follow upon the detection of an gastrointestinal outbreak
- Flowchart to identify tiered options for diagnostic support and contact information
- Line list templates for tracking outbreak progress
- Communication frameworks for reporting outbreaks

Estimated availability on CDC website: December 2011

Toolkit: Sample Communication Framework for Suspected / Confirmed Outbreaks

| Department/Unit/Contact | Role | Department Contact / Address | Contact Authority | Contact Authority / Phone # |
|---|--|------------------------------|------------------------------|---|
| Sample Communication Framework: Suspected or Confirmed Norovirus Outbreaks | | | | |
| <i>(Use groups to be notified - initial outbreak responses. If no more cases, update communication list.)</i> | | | | |
| ESSENCE | Implementation of control measures and education, primary contact in facility outbreak control | | | |
| □ Infection prevention and control | Implementation of control measures and education, primary contact in outbreak control | | H.S. Infection Preventionist | H.S. Malinda Smith mmalinda@cdc.gov/ 515-550-1212 |
| □ Unit / Ward leadership | Coordination of patient isolation equipment, patient/staff case finding, modifications to staff assignments, staff absences, visitor policies | | | |
| □ Clinical laboratory | Notify and coordinate testing incoming stool specimens for norovirus confirmation, minimize capacity for potential diagnostics, instructions on how to label and other specimens | | | |
| □ Environmental services | Assess need for enhanced cleaning frequencies, changes to cleaning and disinfection products for outbreak, coordinate needs for removal/disposal of equipment, waste disposal, ensure correct and complete adherence to cleaning protocols | | | |
| □ Central supply/distribution services | Assess need for increased personal protective equipment use | | | |
| □ Linen services | Anticipate increased need for linen (e.g., privacy curtains) | | | |

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Toolkit: Example Patient or Personnel Line List Worksheet

Acute Gastroenteritis / Norovirus Case Report Worksheet

Reporting facility: _____ Contact Name/Phone Number: _____ Estimated number exposed patients:

Street Address: _____ Outbreak Identification Number (Health Dept. assigned): _____ Estimated number exposed staff:

| Patient/Staff Demographics | | Care location | Symptoms | Outbreak | Diagnosis |
|----------------------------|---|---------------|-----------|--|-----------------------|
| Name | Household (household) Patient ID (staff ID) | Age | Sex (M/F) | Microbiology (stool/urine/nares) Serotype (if available) | Onset (date and time) |
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |

Toolkit: Norovirus Specimen Submission Framework, Options for Healthcare Facilities

Sample Framework: Resources for Specimen Submission during Norovirus Outbreaks

| Department/Unit/Cost/Staff | Contact's Department | Contact Name(s) | Contact phone/email |
|---|---|---|---|
| Primary Options | | | |
| Local healthcare facility or contracted clinical laboratory | Clinical/Virology lead | | |
| Secondary Options | | | |
| Local public health laboratory | 1. Communicable Disease or Outbreak Unit | | |
| | 2. Communicable Diseases or Outbreak Unit | | |
| State public health laboratory | Public Health Laboratory-Virology | | |
| | Epidemiology Division | | |
| Tertiary Options | | | |
| Centers for Disease Control and Prevention | National Calicivirus Laboratory, DASH unit 75 | Dr. Jan Viree Babl | 404-639-1923 404-639-3277 |
| | Division of Viral Diseases | Dr. Ben Logman | 404-639-4832 (Dr. Logman) |
| | Division of Healthcare Quality Promotion | Dr. Aron Hall Infection control/Epidemiology | 404-639-1869 (Dr. Hall) 404-639-4200 (main line) |

Sample Poster

What healthcare providers should know

What is norovirus?
A virus that can cause illness and outbreak in settings (i.e., information of the lining of the stomach and intestines). Both healthy and compromised persons can be affected.

What are the symptoms?
Nausea, vomiting, diarrhea, and some stomach cramping.

Is it contagious?
Norovirus is very easily transmitted through contaminated hands, equipment, surfaces, or food/water.

What can I do to prevent norovirus?
Always perform appropriate hand hygiene, particularly after contact with fecal material or after contact with anyone suspected/confirmed with norovirus. Wear gloves when caring for symptomatic patients.

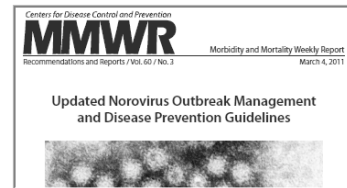
If you have symptoms consistent with norovirus infection, stay home for a minimum of 48 hrs after symptom resolution.

If an outbreak is suspected (2 or more new cases within 24 hrs), contact Infection Prevention and Control.

For more information, visit www.cdc.gov

Other Key Outbreak Management Resources

- CDC Updated Norovirus Outbreak Management and Disease Prevention Guidelines , 2011 (http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6003a1.htm?s_cid=rr6003a1_e)



Summary and Conclusions

- Several key recommendations to assist in the control of norovirus outbreaks in healthcare settings
 - Recommendations are supported by the available evidence
 - First norovirus guideline to systematically review and evaluate the literature
- Still a lot we don't know about in terms of transmission dynamics, best methods for hand hygiene / environmental disinfection
- Norovirus research needs to characterize interventions used in outbreaks and measure their real-world efficacy

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Thank you!

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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COMING SOON ...

- 01 December 11 **Strategies for Improving Hand Hygiene Compliance in the ICU**
Speaker: Dr. Alexandre R. Marra, Hospital Israelita Albert Einstein, Brazil
Sponsor: Deb Ltd (www.debgroup.com)
- 07 December 11 (Free WHO Teleclass) **Best Practice for Cleaning, Disinfection, and Sterilization in Healthcare**
Speaker: Prof. William Rutala, University of North Carolina
Sponsor: World Health Organization First Global Patient Safety
Challenge: Clean Care is Safer Care (www.who.int/gpsc/en)
- 15 December 11 **Surgical Implants Being Reprocessed: Pandora's Surgery Box is Opened!**
Speaker: Dr. Michelle Alfa, Diagnostic Services of Manitoba

www.webbertraining.com/schedule1.php



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