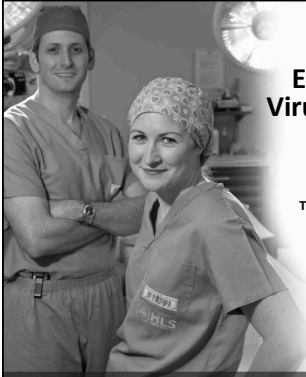


# Emerging Respiratory Viruses: Are Healthcare Workers Protected?

## Dr. Virginia Roth, The Ottawa Hospitals & University of Ottawa

### A Webber Training Teleclass




The Ottawa Hospital | L'Hôpital d'Ottawa

### Emerging Respiratory Viruses: Are Healthcare Workers Protected?

Virginia Roth, MD, FRCP, MBA  
The Ottawa Hospital & University of Ottawa

Hosted by Paul Webber  
paul@webbertraining.com


www.webbertraining.com November 13, 2014



## Outline


- SARS 2003
- Novel H1N1 2009
- MERS CoV 2012
- Ebola 2014
- Lessons for Future Outbreaks

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### Severe Acute Respiratory Syndrome (SARS)

- Feb 28: Identified in a Hanoi patient with atypical pneumonia (Dr. Carlo Urbani)
- Mar 7: First Canadian case admitted to hospital
- Mar 10: 22 HCW in Hanoi fall ill
- Mar 11: Hospital outbreaks in Hong Kong
- Mar 12: WHO alert issued
- Impact: 8,096 cases, 774 deaths




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### SARS: Vulnerability of Healthcare Workers

Dr Nestor Yanga




- 54 year old family physician, Toronto
- Apr 1-2: examined 3 patients with undiagnosed SARS
- Apr 4: fever, myalgia, diarrhea, cough
- Apr 8: admitted to hospital
- Apr 13: respiratory failure to ICU
- BiPAP, difficult intubation
- Aug 13: succumbed to SARS

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### “Protected HCW” Get SARS


- 9 HCW caring for Dr. Yanga developed SARS
  - 6 present during intubation
- Intubation: negative-pressure HEPA filtered room
- All wore recommended PPE
  - Gowns, gloves, PCM2000 mask, goggles /face shield



Ofner et al. CDR '03  
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### SARS in Protected HCW Toronto, 2003



- 18 suspect / probable cases
- Associated with high-risk procedures / patients
- Incorrect use of PPE:
  - Formal training before SARS assignment = 31%
  - Inadequate eyewear = 67%
  - Moist mask = 25%
  - Failure to change b/w patients = 19%

Health Canada; Ofner et al. CDR 2003


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"Possibility of self-contamination"




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## Virus Transfer from PPE to HCW Skin and Clothing

- PPE contaminated with non-enveloped non-pathogenic RNA virus and glo-germ
- 10 volunteers took BP from mannequin
- Instructed to remove PPE following CDC protocol



Casanova et al. *Emerg Infect Dis* 2008

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Table. Frequency and levels of viral contamination of selected sites, virus transfer study, 2007\*

Site	% Volunteers who transferred virus to site (N = 10)	Mean viral titer recovered from site (log <sub>10</sub> MPN)	% Contaminated sites with visible tracer (N = 10)
Nondominant glove	80	2.2	10
Right hand (skin)	90	2.4	20
Left hand (skin)	70	1.8	0
Scrub shirt	100	3.2	10
Scrub pants	75†	2.1	0
Face	0	-	-

\*MPN, most probable number; -, not measured. †N = 8.

**Conclusions:**

- Need altered protocols
- Importance of hand hygiene between steps



Casanova et al. *Emerg Infect Dis* 2008

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### Table 1 Numbers of Probable Cases of SARS, Deaths, and Healthcare Workers Infected in Selected Countries and Globally

	Cumulative No. of Cases	Deaths No. (%)	Workers Infected No. (%)
Canada	251	41 (17)	108 (43)
China	5,327	349 (7)	1,002 (19)
Hong Kong	1,755	299 (17)	386 (22)
Taiwan	346	37 (11)	68 (20)
Philippines	14	2	4 (29)
Singapore	238	33	97 (41)
Thailand	9	2	1 (11)
Vietnam	63	5	36 (57)
Global	8,098	774	1,707 (21)

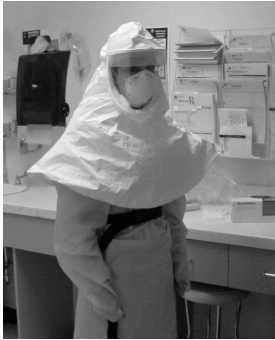
Chan-Yeung *Int J Occup Environ Health* 2004

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## SARS Response

- Changing directives
- New equipment
- Increased complexity
- Difficult removal
- Clinical challenges



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## Clean Your Hands

Respiratory illnesses like the flu spread easily.

Read Carefully

- Do you have a NEW cough or sore throat has become WORSE?
- Are you SNEEZING or BURSTING? Please put on a mask.
- Are you feeling FEVERISH?

If the answer to ALL of these questions is YES, please see the receptionist or nurse right away.  
For more information, see resources.




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 **Protected Code Blue**

“My 'problem' is that emergency physicians and nurses thrive in heroics and do this by nature. So we need evidence-based information and to clearly show them why they must not do that which they gravitate towards.”






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 **Psychological Impact of SARS**


- Fear – unknown virus, sick colleagues
- Anger – insufficient protection
- Confusion – constant change in practice
- Isolation – “work quarantine”, family separation
- Ostracism – public prejudice
- Exhaustion – added equipment, stress
- Reduced human contact – barrier equipment

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 **Right to Refuse Work**


Argument	Counter Argument
<ul style="list-style-type: none"> <li>• Firefighters don't get to select which fires to attend</li> <li>• Police don't get to select which dark alleys they walk down</li> </ul> 	<ul style="list-style-type: none"> <li>• We don't expect firefighters to jump into a burning pit</li> <li>• We don't expect police to jump in front of a bullet</li> </ul> 

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 **Professional Organizations**

Nurses' Association: Nurses have a right to refuse to work where unsafe conditions exist and they cannot be adequately protected ...


Medical Association: Physicians are not all required to be heroes, especially if they could do more good for patients by staying away from dangerous front-line situations.



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 **The Ethics of SARS**

- HCW have a duty to:
  - care for the sick
  - care for themselves in order to carry out duties
- Institutions have duty to:
  - support and protect HCW
  - provide safe environment
- Public / leaders have a duty to:
  - recognize heroism of front-line medical workers




University of Toronto Joint Center for Bioethics

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 **Novel Influenza A (pH1N1)**

- March 2009: First cases in Mexico and US
- June 11, 2009: WHO declares global pandemic
- Sept 2009: > 296,000 cases, ~ 3500 deaths worldwide
- Affected children and young adults (median age = 18)
- Ability to cause severe pneumonia
- Higher risk of complications in pregnancy
- Community exposure

Evan Frustaglio



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American Journal of Infection Control 41 (2013) 240-4

Are health care workers protected? An observational study of selection and removal of personal protective equipment in Canadian acute care hospitals  
Mitchell R, Roth V, Gravel D, et al. AJIC 2013

	Physician (n=53)	Nurse (n=228)	Allied Health (n=42)	HSK (n=19)
Gloves	79%	88%	95%	95%
Gown	81%	82%	93%	79%
Eye Protection	26%	41%	33%	42%
Mask	79%	89%	88%	79%
Correct Removal	36%	56%	55%	78%

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INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY DECEMBER 2011, VOL. 32, NO. 12

### Transmission of 2009 Pandemic Influenza A (H1N1) Virus among Healthcare Personnel—Southern California, 2009

TABLE 3. Healthcare-Transmitted Pandemic 2009 H1N1 Serologic Attack Rates by Self-Reported Use of Personal Protective Equipment (PPE) among Exposed Healthcare Personnel—Southern California, 2009

	No. (total cohort = 63)	Serologic attack rate		P
		With factor	Without factor	
PPE use	46	5 (11)	4 (24)	.24
Glove use during index patient exposures				
Any use	45	5 (11)	4 (22)	.26
Use during 100% of exposures <sup>a</sup>	29	3 (10)	6 (18)	.49
Mask or N95 respirator use during index patient exposures <sup>b</sup>				
Any use	20	0 (0)	9 (21)	.047
Use during 100% of exposures <sup>a</sup>	12	0 (0)	9 (18)	.18

27% reported no PPE use

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### The Airborne Droplet Continuum

**Droplet\***  
Particle size: 50–100 µm  
Range from face to face (< 2 metres)

**Airborne\***  
Particle size: 10–50 µm  
Range from face to face to within the room

**Airborne\***  
Particle size: < 10 µm  
Range from face to face to beyond the room

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### Novel Influenza A (H1N1) Conflicting Guidelines Over Masks

	Care of Pt with Confirmed or Suspected Novel H1N1	Aerosol Generating Medical Procedures
WHO	Regular mask <1 m of pt	N95 respirator
CDC	N95 respirator to enter pt room	N95 respirator
PHAC	Regular mask <2 m of pt	N95 respirator
Ontario	N95 respirator <2 m of pt	N95 respirator

"Current evidence supports handling H1N1 on the basis of droplet transmission consistent with recommended precautions for seasonal influenza." Statement from Society for Healthcare Epidemiology of America (SHEA) June 2009

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### Middle East Respiratory Syndrome Coronavirus (MERS-CoV)

- April 2012: severe acute respiratory illness of unknown etiology
- By April 2014: 495 cases - Saudi Arabia, Qatar, Jordan, UAE
- 96 (19%) HCW
  - 66 (66%) in April 2014
- >60% of 128 cases in Jeddah were nosocomial
  - 39 HCW
  - 6 required ICU or died

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The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 AUGUST 1, 2013 VOL. 369 NO. 5

### Hospital Outbreak of Middle East Respiratory Syndrome Coronavirus

- 21 healthcare-related cases
  - Person to person transmission: HCW and household contacts
  - Many patients: no transmission
  - Few patients: multiple infections (super-spreaders)

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## Ebola



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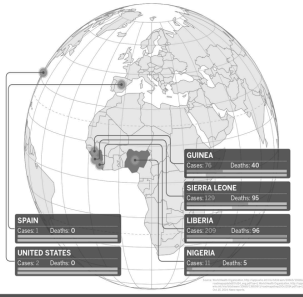
## Ebola in Madrid

- Oct 6: Nurse's aid confirmed positive for Ebola
- Treated 2 missionaries who died of Ebola Aug-Sep 2014
- Followed protocol (touched her face with her gloves?)
- Spokesperson – "Its obvious that the patient herself has recognized that she did not strictly follow the protocol."
- "We're really angry" said one nurse. "She is the victim, and they are criminalizing her as if she was the one responsible for all that has happened"
- Oct 12: Concerns about training and safety standards lead to work refusals

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On the Frontlines:  
Where Health Care Workers Have Contracted Ebola  
Current Ebola Outbreak: October 16, 2014



Country	Cases	Deaths
GUINEA	76	40
SIERRA LEONE	127	95
LIBERIA	209	96
UNITED STATES	7	0
SPAIN	1	0
NIGERIA	11	5

Category	Count
Cases of Ebola in the General Population	8,998
Cases of Ebola in Health Care Workers	428
Deaths from Ebola in the General Population	4,493
Deaths from Ebola in Health Care Workers	236

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## Ebola in US

- Sep 20: Liberian man arrives in Dallas
- Sep 24: Low-grade fever, abdominal pain, headache
- Sep 26: Presents to ED - sent home
- Sep 28: Worsens - return to ED and placed in isolation
- Sep 30: Confirmed Ebola
  - Moved to isolation unit, addition of PPE layers
- Oct 8: Dies
- Oct 10: Nurse develops low-grade fever
- Oct 12: CDC confirmed Ebola positive
- Oct 14: 2<sup>nd</sup> nurse confirmed positive

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**npr**  
Dallas Nurse Caught Ebola Despite Safety Gear, Can't Pinpoint Breach  
by THE ASSOCIATED PRESS  
PUBLISHED 10:28 AM CST 10/16/14




- ED screening
- Communication
- High-risk procedures
- Self-contamination
- PPE removal without supervision
- Variability in PPE
- Conflicting recommendations

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## Why did Dallas Nurses get Infected?



Dr. Pierre Rollin CDC

- Following recommendations
- Responsive administration
- Competent committed staff
- Heroic measures (dialysis):
- "We never recommend, in Africa, to do that type of thing ... It's very risky and the likelihood of saving someone is very low. When every organ starts to fail, you're not going to save them."

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### Nurses' Perspective

- US – National Nurses United
  - Nurses “strongly feel unsupported, unprepared, lied to and deserted to handle their own situation”
- Spain - Juan Jose Carlos, Satse nursing union
  - “Their children aren't being invited to birthday parties and their friends are cancelling joint holiday plans”
  - “They've become known as the Ebola nurses. And it's not fair.”



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### Ebola cruise ship 'in utter panic' as Mexico and Belize refuse to let it dock

THE INDEPENDENT – October 24, 2014



### Bellevue hospital (NY)

- More than a dozen employees report discrimination
- Not welcomed at business or social events
- Refused services

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### PPE Challenges






Image credit: WHO

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### Are Healthcare Workers Protected?

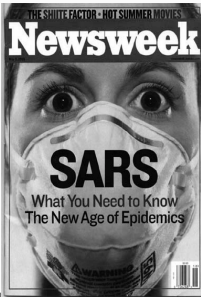
Depends on...

- Risk assessment
- Availability of PPE
- Proper use of PPE
- Preventing self-contamination

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### Lessons for Future Outbreaks



1. Screening
2. Thoughtful PPE selection
3. Minimize change
4. Training / retraining
5. Supervision
6. Minimize high risk procedures
7. Hospital /public responsibility

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### Coming Soon

November 17 (FREE Teleclass - Broadcast Live from Healthcare Infection Society Conference)  
**AIRBORNE TRANSMISSION AND PRECAUTION - FACTS AND MYTHS**  
 Prof. WH Seto, The University of Hong Kong, China

November 17 (FREE Teleclass - Broadcast Live from Healthcare Infection Society Conference)  
**NOROVIRUS - 2 LECTURES**  
 Dr Ben Lopman, Centers for Disease Control & Prevention, USA,  
 Professor Marion Koopmans, Erasmus Medical Centre, The Netherlands

November 18 (FREE Teleclass - Broadcast Live from Healthcare Infection Society Conference)  
**DEBATE: HIGH-TECH DECONTAMINATION OF THE ENVIRONMENT**  
 Professor Hilary Humphreys, The Royal College of Surgeons, Ireland,  
 Professor Markus Dettenkofer, University of Freiburg, Germany,  
 Dr Philip Carling, Boston University School of Medicine,  
 Mr Peter Hoffman, Public Health England

November 20 **THE ROLE OF COMPANION ANIMALS IN INFECTION TRANSMISSION**

[www.webbertraining.com/schedule1.php](http://www.webbertraining.com/schedule1.php)

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