


Why be vaccinated?



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Disclosures

- I have received a research grant from SAGE for a project on CLABSI risk factors in the NICU (ended in 2015)
- Chair, National Advisory Committee on Immunization

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Objectives

- Discuss why HCW need to be vaccinated
- Discuss potential impact of HCW's vaccination on later life protection
- Discuss/deal with impact of anti-vaccination messages

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Why do we vaccinate? (A few principles)

Objectives of vaccination programs **depend** on:

1. Efficacy/Effectiveness of available vaccines
2. Ability to reach target population
3. Epidemiology of disease


Program's **objectives** may be to:

1. Eradicate disease (e.g. smallpox)
2. Eliminate disease (i.e., no sustained transmission)
3. Control disease (i.e., no mortality/morbidity)



Herd immunity

- Infectious disease transmission is proportional to the % of susceptible individuals
- Transmission decreases with increase in protected people (vaccinated + recovered from disease).
- Proportion of protected people $> 1 - 1/R_0$
- For measles $R_0 = 15$ requiring 94% of population to be protected to stop transmission



Why vaccinate?


Possible measles exposure at MUHC Glen (adult) Site
 Press Release
 Apr 7, 2019

[Text Size](#)

MONTREAL — The McGill University Health Centre (MUHC) was notified by the Direction régionale de santé publique de Montréal late Friday that an employee having contracted the measles virus worked at the Glen Site while contagious, between March 23 and March 27.


The MUHC is now in the process of identifying and informing all patients and personnel who worked in or visited the following locations during the hours specified below that they may have been exposed to the measles virus:

Date of Exposure	Periods		Periods
	Location	Location	
Saturday, March 23, 2019	10:00 - 11:00 D3-ICU	10:00 - 11:30 D7 - Cardiac Surgery Unit	
Sunday, March 24, 2019	10:00 - 11:00 D3-ICU	10:00 - 11:30 D7 - Cardiac Surgery Unit	
Monday, March 25, 2019	7:45 - 8:45 D3-ICU	8:00 - 9:00 D7 - Cardiac Surgery Unit	9 - 12:30
Tuesday, March 26, 2019	7:45 - 8:45 D3-ICU	8:00 - 9:00 D7 - Cardiac Surgery Unit	CRC Cardiovascular, heart failure, heart transplant clinic
Wednesday, March 27, 2019	10:00 - 11:00 D2 - Infectious diseases clinic		



HCW vaccination


- HCW, including students, contract workers and volunteers: at risk of **exposure** to communicable diseases due to contact with patients
- Risk that HCW could **transmit** an undiagnosed vaccine-preventable disease to others
- Some healthcare institutions/jurisdictions: vaccination being a **condition of employment**

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Vaccine	Recommendation(s)
BCG	Consider use only in specified high-risk circumstances
Diphtheria Tetanus	All HCW should be immune Primary series if no previous immunization [1] Booster doses of Td vaccine every 10 years
Hepatitis B	If no evidence of immunity [2]
Influenza	Annually
Measles	If no evidence of immunity (refer to text), regardless of age - 2 doses
Meningococcal	Not routinely for HCW Quadrivalent conjugate meningococcal vaccine for clinical laboratory workers who handle N. meningitidis specimens - 1 dose with a booster every 5 years if at ongoing risk
Mumps	If no evidence of immunity (refer to text), regardless of age - 2 doses
Pertussis	A single dose of Tdap vaccine if not previously received in adulthood.
Polio	Primary series if no previous immunization - 3 doses. Unvaccinated HCW at highest risk of exposure should be particularly targeted for primary immunization. A single lifetime booster dose for HCW at highest risk of exposure.
Rubella	If no evidence of immunity (refer to text) - 1 dose
Travel vaccines	For HCW planning to work abroad, consider hepatitis A, cholera, Japanese encephalitis, tick-borne encephalitis, typhoid, and yellow fever vaccines prior to departure Re-vaccination for some vaccines if ongoing risk.
Varicella	If no evidence of immunity (refer to text) - 2 doses [3] CIG, evergreen!

Influenza vaccination

Because it is needed every year... and is a daunting task!

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Influenza vaccine

- Trivalent:
 - 2 A (H3N1/H1N1)
 - + 1 B
- Quadrivalent:
 - 2 A + 2 B

Influenza: Antigenic Drift and Shift

Need for annual vaccination
Match will determine effectiveness

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HCW influenza vaccination

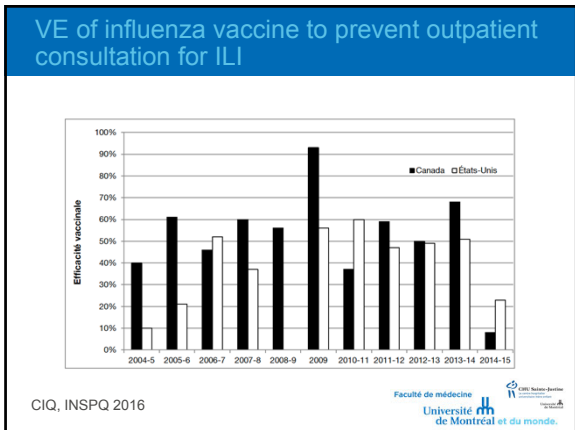
- **Objective:** Decrease influenza transmission from HCW to vulnerable patients
- How are we doing?
 - In Canada, without mandatory vaccination programs: 40-60%
 - If mandatory or vaccinate or mask: 95%
- Is this the solution?

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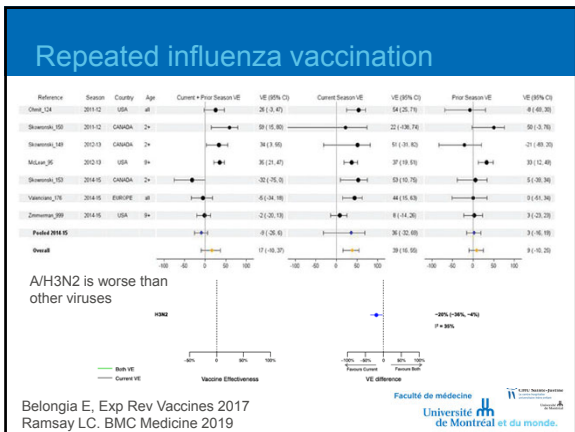
Influenza vaccine efficacy/effectiveness

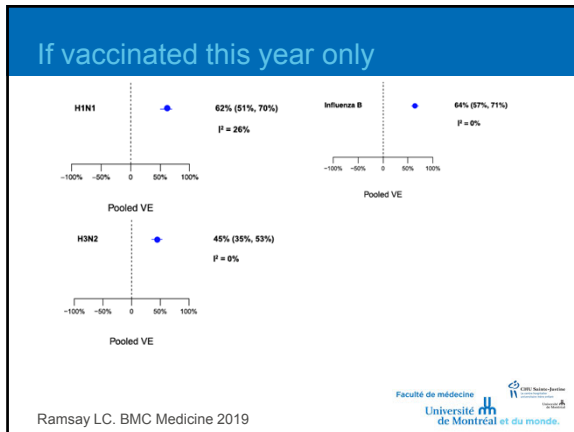
- **Efficacy** (controlled setting i.e., RCT) vs. **Effectiveness** (real life)
- Are we talking 80-90% or 40-50%?
 - Depends on how it is measured.
 - Older studies = seroconversion tends to **overestimate VE**
 - Newer studies = viral culture and PCR (NAAT)
- Meta-analysis showed an average VE of:
 - 61% (A/H1N1)
 - 54% (B)
 - 33% (A/H3N2) → 80% admissions/ deaths

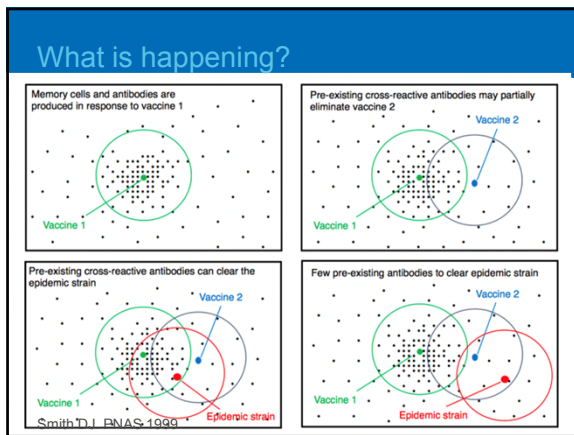
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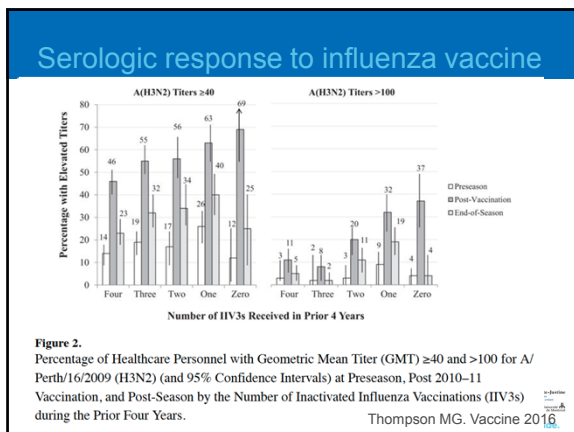


- ### What about HCW?
- Impossible to determine who patients catch influenza from
 - Having HCWs protected is helpful
 - RCTs (cluster) trying to show that an increase in vaccination coverage decreased nosocomial influenza failed to demonstrate impact (design issues)
 - Nosocomial influenza:**
 - CNISP: 7% of 3299 cases (6 seasons)
 - FluSurv-NET: 2.7% of 6171 cases
 - Estimated NNV to prevent one nosocomial influenza death > 32 680
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What does that all mean??

- Repeated influenza vaccination tends to decrease immune response and decrease VE
- **BUT:**
 - It is hard to know **AHEAD** of the season if the interference will be positive (better VE) or negative
 - It depends on the match between vaccine strains and circulating virus
- Given uncertainties, is it ethical to make vaccination **mandatory?**



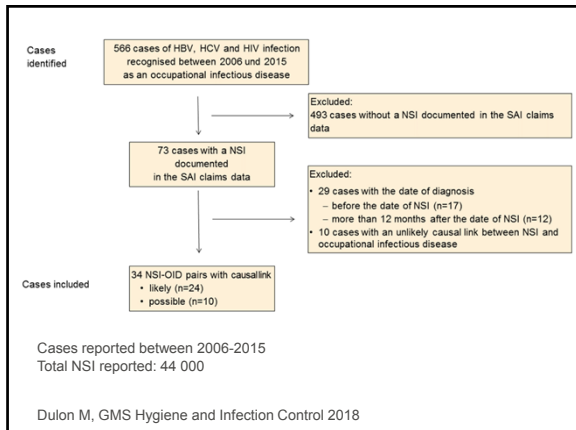
Therefore...

- **HCW** should **not work if sick** or at least wear a mask and be highly compliant with hand hygiene
- Influenza vaccine will provide HCW with **direct** protection – variable VE ~ 50%
- Studies to determine role of HCW vaccination in herd immunity are needed (good studies) – it is **likely that a protected HCW will protect patients**



Other vaccines





Hepatitis B: individual protection

Table 1: Assessment of the causal link between needlestick injury and occupational infectious disease by disease

Causal link	Hepatitis B (n=2)	Hepatitis C (n=30)	HIV/AIDS (n=2)	Total (n=34)
Likely	1	21	2	24
Possible	1	9	0	10

Table 2: Serological finding of the initial test by disease

Initial finding*	Hepatitis B (n=2)	Hepatitis C (n=30)	HIV/AIDS (n=2)	Total (n=34)
Negative	0	16	0	16
Positive	2	3	0	5
Unknown	0	11	2	13

*Blood sampling within 5 days after the needlestick injury

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Table 3: Activity and device involved in NSIs and index case by initial serological finding (NSI, needlestick injury)

	Initial serological finding		
	Negative/Unknown (n=29)	Positive (n=5)	Total (n=34)
Activity			
Taking blood sample	5	0	5
Insertion/removal of catheter	5	0	5
During surgery (task unknown)	3	1	4
Insulin injection	1	0	1
Disposal of cannula (n=8), recapping (n=1)	9	0	9
Tidying up/waste disposal	4	0	4
Missing	2	4	6
Device			
Intravenous catheter, IV cannula	14	0	14
Suture needle, scalpel	2	1	3
Insulin pen ¹	1	0	1
Lancet ²	1	0	1
Type of cannula/type of instrument not stated	11	4	15
Index case			
Known	22	1	23
Missing	7	4	11

¹ During insulin administration; index case unknown
² When handling a waste bag; index case unknown

Hepatitis B vaccine

- **Immunogenicity:**
 - If anti-HBs titre **at least 10 IU/L**: considered protected for life (except immunocompromised and chronic renal disease)
 - Major determinant of seroprotection rates: **age** – best when administered between 5-15 years, with gradual decrease with age.
- **Efficacy**
 - 95-100% effective in pre-exposure for at least 30 years.




Measles: am I immune?

Table 1: Criteria for measles immunity

Routine immunization	Health care workers	Travellers to destinations outside North America	Students in post-secondary educational settings	Military personnel
Documentation of vaccination: <ul style="list-style-type: none"> ◦ Children 12 months to less than 18 years of age: 2 doses [1] ◦ Adults 18 years of age and older born in or after 1970: 1 dose [1, 2] OR History of laboratory confirmed infection OR Laboratory evidence of immunity OR Born before 1970	Documentation of vaccination with 2 doses [1] (regardless of year of birth) OR History of laboratory confirmed infection OR Laboratory evidence of immunity	Documentation of vaccination: <ul style="list-style-type: none"> ◦ If born in or after 1970: 2 doses [1] ◦ If born before 1970: 1 dose [1] OR History of laboratory confirmed infection OR Laboratory evidence of immunity	Documentation of vaccination: <ul style="list-style-type: none"> ◦ If born in or after 1970: 2 doses [1] ◦ If born before 1970: consider 1 dose [1] if no documentation of receipt of measles-containing vaccine OR History of laboratory confirmed infection OR Laboratory evidence of immunity	Documentation of vaccination with 2 doses [1] (regardless of year of birth) OR History of laboratory confirmed infection OR Laboratory evidence of immunity OR CIG, Evergreen!

A question from my friend, Ramona R!

- How about serology testing: IgG on everyone upon employment?
 - Question of **cost-effectiveness** (for staff health)
 - If no documentation in doubt: **vaccinate!** Give the 2 doses of MMR
 - If some doubt remains: Measles IgG allowed... but as the medical director for the labs, cost matters... charged to your budget☹.



Varicella: I think I had chickenpox...

Immune IF:

- Documented **2 doses** of vaccine
- Laboratory evidence of immunity **OR**
- **Self-reported history** (healthy individuals, including HCW) currently or previously employed in a Canadian healthcare setting IF disease happened **before implementation of a 1-year VZ program** (~ 2004)


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Table 1: Implementation of one dose varicella immunization programs in canadian provinces and Territories

Province or territory	Year of program implementation
Prince Edward Island	2000
Alberta	2001
Northwest Territories	2001
Nova Scotia	2002
Nunavut	2002
Ontario	2004
New Brunswick	2004
Manitoba	2004
Newfoundland and Labrador	2005
Saskatchewan	2005
British Columbia	2005
Quebec	2006
Yukon	2007

Can I trust my mother?

- For HCW, PPV of self- or parental reported disease:
 - 95% (range: 89-100%)
 - LR+ of reporting a history of VZ: 2.28

Recommendation #3: For HCWs who are currently employed in or who have been employed in another Canadian healthcare setting

Individuals who have ANY of the following are considered immune to varicella:

- Self-reported history or diagnosis of varicella or herpes zoster by a health care provider, if the disease occurred before the year of implementation of a varicella vaccine program (one dose) (Grade B);
- Documented evidence of immunization with two doses of a varicella-containing vaccine (Grade A);
- Previous laboratory evidence of varicella immunity ^{R1} (Grade A)

New employment in a healthcare setting (i.e. Canadian HCW moving into a new facility within Canada) should be seen as an opportunity to assess immunity to varicella and to offer two doses of varicella vaccine when the HCW has not been shown to be immune.

Following exposure to varicella within health care settings, verification of immunity, based on documented evidence of immunization with two doses of a varicella-containing vaccine or laboratory evidence of immunity, should be a part of post-exposure protocols.

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 NACI recommendations 2015


Recommendation #4: For HCWs who are newly hired into the Canadian healthcare system

Individuals who have ANY of the following are considered immune to varicella:

- Documented evidence of immunization with two doses of a varicella-containing vaccine (Grade A);
- Previous laboratory evidence of varicella immunity ^R (Grade A).


Following exposure to varicella within health care settings, verification of immunity, based on documented evidence of immunization with two doses of a varicella-containing vaccine or laboratory evidence of immunity, should be a part of post-exposure protocols.

Recommendation #5: Immunization should be offered to all susceptible individuals without contraindications to varicella vaccination. Pregnant women who are not considered immune to varicella (as per Recommendation #1) should have vaccination offered post-partum (Grade A).

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Another question from my friend, Ramona!

- «We are seeing a lot of disseminated zoster, here too why are HCW not asked for proof of immunity for varicella (IgG)....!!! It is much cheaper than having to do exposures, work late hours, deal with worried patients and staff and rush IgG.... »
- She is right!
- To deal with exposures, should know **BEFORE** HCW's status. Need a good pre-employment screening.
- In doubt, **just vaccinate!**

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What to do about vaccine hesitancy?

- Difference between anti-vaxxers and vaccine hesitant
- To overcome cynicism, be **transparent** – there are things we don't know. What we know, we disclose
- The overall objective of vaccination is to protect HCW and patients
- Vaccines are not risk-free: like a medication. Goal is for **benefits to outweigh risks**
- Critical review of evidences

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Take home messages

- HCW vaccination is important to:
 - **PROTECT** HCWs from infections they may encounter in their daily work
 - **PROTECT** patients they care for
- Influenza: we need a better vaccine
 - Yet, it is our responsibility to be vaccinated
 - HCW influenza vaccination should not become mandatory
