Back to School!
School-based vaccination: opportunities and challenges

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• Why school-based delivery of vaccination?
• Overview of Ontario’s 3 school-based programs
• Real world challenges in implementation
• Discussion
Approaches to adolescent immunization

- **Status-quo**
  - Vaccination at opportunistic visits with healthcare providers (HCPs)

- **School-linked mandates**
  - Documentation of immunization is required for school attendance

- **Voluntary-school based vaccination clinics**
Rationale for school-based delivery

• Provide a platform to reach adolescents
  • Adolescents have low HCP attendance\(^1\), especially males\(^2\)

• Improve compliance/coverage of multiple-dose vaccines

• Immunize before onset of risk behaviours
  • Sexual debut, injection drug use, etc.

Benefits: Coverage

• “Natural experiment” in Montérégie Health Region, Quebec

• 1994: School-based Hepatitis B program began (grade 4)

• 1996: 1 CLSC (of 19) stopped school-based delivery
  • Available by clinic appt. (Wed. eve and Saturdays)

• Compared vaccine coverage and costs
  • 3 comparator CLSCs based on comparable demographics
  • Cost surveys completed by CLSC, parents, school principals

Figure 1. Vaccination Coverage* Against Hepatitis B in the Four CLSCs in Study, School Years 1994-1995 to 1999-2000

* Three doses of vaccine. No data are available for year 1996-1997 in C-CLSC.
Benefits: Costs

- Guay et al (2003)^1^: Cost per student vaccinated with 3 doses
  - <$40/student with school-based delivery
  - $63/student clinic-based delivery
  - Parental costs valued at minimum wage

- Deuson et al (1999)^2^: Cost per dose administered
  - $31/dose school-based delivery
  - $68/dose HMO delivery
  - $118/dose when parental indirect costs (absenteeism) included

1. Guay et al. CJPH 2003;94:64-67
Benefits: Health equity?
Hepatitis B vaccine

- Goldstein et al (2001)\(^1\): Non-traditional measures of SES (lunch subsidies and standardized test scores) were negatively associated with coverage at a class level

- Wallace (2004)\(^2\): Neighbourhood deprivation most strongly related to uptake
  - Most deprived areas: reduced odds of receiving 3 doses (OR 0.47, 95% CI 0.40-0.55)

Benefits: Health equity? HPV vaccine

• Ogilvie et al (2010)\textsuperscript{1}: Higher parental education associated with lower uptake of HPV vaccine in British Columbia

• Smith (2010)\textsuperscript{2}: HPV vaccine coverage from KFLA Health Unit
  • Series initiation was not influenced by neighbourhood income
  • Girls from lowest income neighbourhoods less likely to complete (OR 0.45, 95% CI 0.28-0.72)

• Roberts (2011)\textsuperscript{3}: HPV vaccine uptake highest in least deprived areas in UK
  • Active refusals highest in more affluent areas
  • Non-response highest in more deprived areas

Other benefits

• Peer support at the time of vaccination\(^1\)
• Convenience\(^1\)
• Education
• Relationship building
• Opportunity to evaluate new schedules\(^2\)

Overview of Ontario’s school-based vaccination programs
Hepatitis B Vaccination program

• Hepatitis B: blood-borne virus
  • Horizontal and vertical transmission
  • Risk of chronic carrier state inversely related to age at infection

• First school-based program in Ontario
• Implemented in the 1994/1995
• Targets grade 7 students
• Extended eligibility until end of grade 8
• 2 dose schedule implemented in 2000/2001
Hepatitis B goal

- Reduce the prevalence of indigenously acquired chronic hepatitis B infections in children and young adults by 90% by 2015

Targets

- Screen 100% of pregnant women and immunize 100% of their neonates with vaccine and hepatitis B immune globulin by 1995
- Establish universal hepatitis B immunization for children by 1997
- Achieve and maintain 95% hepatitis B immunization of populations targeted in universal programs by 1997
Publicly funded immunization programs in Canada.
Available at http://www.phac-aspc.gc.ca/im/ptimprog-progimpt/table-1-eng.php
What is the ideal program – Infant or adolescent?

- **WHO recommendation**: birth dose
  - Perinatal/Early postnatal transmission important cause of chronic infections
  - Recommends even in low-endemicity countries
  - Would protect infants born to women not screened in pregnancy

- **Duration of protection**
  - Observational studies: protection 22 years post-vaccination in infancy
  - WHO/Canada/ACIP: no recommendation for routine booster

- **Epidemiology of hepatitis B in Canada**
  - Under-reporting of infant cases (asymptomatic)
  - Older cases more likely to be symptomatic
  - Immigration driving incidence/prevalence

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Invasive meningococcal disease (IMD) Vaccination Programs

- IMD
  - Identification of Neisseria meningitidis from a sterile site
  - Serogroups A,B,C,W-135, Y
  - IMD endemic in Canada
  - Incidence highest among infants and adolescents (15-19 years)
  - High public dread
Vaccine recommendations and Ontario program history

• 2001: NACI recommendations for Meningococcal C conjugate (MCC) vaccine
  • Infants <1 yr, children 1-4 yrs, adolescents and young adults

• 2004/2005: Ontario MCC programs implemented
  • Toddler program (1 dose at 12 months)
  • School-based program, grade 7 students (1 dose)

• 2005: National Consensus Conference for Vaccine-Preventable Diseases in Canada
  • Coverage target of 90% for MCC vaccine at age 17 by 2012
Vaccine recommendations and Ontario program history

- Oct. 2006: Quadrivalent meningococcal conjugate vaccine (MCV4) Menactra® authorized for use in Canada

- May 2007: NACI recommended continued use of MCC for routine adolescent immunization
  - Unless local epidemiology warranted use of MCV4

- April 2009: NACI recommended routine adolescent immunization against IMD, even if vaccinated infancy
  - Adolescent dose can be MCC or MCV4

- 2009/2010: Ontario grade 7 program changed to MCV4
  - 1 dose; once eligible, always eligible

- July 2010: MCV4 vaccine, Menveo® authorized for use in Canada
<table>
<thead>
<tr>
<th>P/T</th>
<th>Men C – C Program</th>
<th>Booster</th>
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<tbody>
<tr>
<td>BC</td>
<td>Infant (2,12 mo)</td>
<td>Grade 6 – MCC</td>
</tr>
<tr>
<td>AB</td>
<td>Infant (2,4,12 mo)</td>
<td>Grade 9 – MCV4</td>
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<tr>
<td>SK</td>
<td>Toddler (12 mo)</td>
<td>Grade 6 – MCV4</td>
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<tr>
<td>MB</td>
<td>Toddler (12 mo) + Catch-up grade 4</td>
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<tr>
<td>ON</td>
<td>Toddler (12 mo)</td>
<td>Grade 7 – MCV4</td>
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<tr>
<td>QC</td>
<td>Toddler (12 mo) + Catch-up &lt; 18 yrs</td>
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<tr>
<td>NB</td>
<td>Toddler (12 mo)</td>
<td>Grade 9 – MCV4</td>
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<td>NS</td>
<td>Toddler (12 mo)</td>
<td>Grade 7– MCC</td>
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<tr>
<td>PE</td>
<td>Toddler (12 mo)</td>
<td>Grade 9 – MCV4</td>
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<tr>
<td>NL</td>
<td>Toddler (12 mo)</td>
<td>Grade 4 – MCV4</td>
</tr>
<tr>
<td>NT</td>
<td>Infant (2,12 mo) + Catch-up Grade 9</td>
<td>Post-secondary students leaving NT-MCV4</td>
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<tr>
<td>YT</td>
<td>Infant (2,12 mo) + Catch-up Grade 6</td>
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</tr>
<tr>
<td>NU</td>
<td>Toddler (12 mo) + Catch-up Grade 9</td>
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Considerations and research priorities

• Choice of vaccine
  • Phase III RCT data suggests improved immunogenicity of Menveo® over Menactra® in adolescents (11-18 years) \(^1\),\(^2\)

• Assessment of vaccine coverage through IRIS
  • IRIS cannot distinguish between MCC and MCV4

• Research priorities identified by NACI\(^3\)
  • Vaccine effectiveness
  • Duration of protection
  • Impact on meningococcal carriage and herd immunity

Human Papillomavirus (HPV)

• 100 genotypes: high risk and low risk types
  • High risk types: cancers of the cervix, vulva, vagina, anus, penis and head/neck
  • Low risk types: genital warts and recurrent respiratory papillomatosis

• HPV point prevalence ranges from 11 to 29%\(^1,2\)

NACI and CIC HPV Vaccine Recommendations

• NACI (2007)\(^1\):
  • Females between 9 and 13 years of age as the group for whom vaccine effectiveness would be greatest

• CIC (2007)\(^2\):
  • School-based HPV vaccination of one female cohort (grades 4-8) to be implemented in all P/Ts
  • Coverage targets of 80% within 2 years and 90% within 5 years

• NACI (2012)\(^3\):
  • HPV4 vaccine recommended for females and males (ages 9-26)
  • Vaccination between 9 and 13 years maximizes benefit

1. NACI. Statement on Human Papillomavirus (HPV) Vaccines. 2007
2. CIC. Recommendations on a HPV immunization program. 2007
3. NACI. Update on Human Papillomavirus (HPV) Vaccines. 2012
Ontario’s School-based HPV Immunization Program

- 2007/2008: Program implementation
  - Announced summer of 2007
- Target: grade 8 girls
- Extended eligibility into grade 9 year
- 3 dose vaccine schedule
- School board participation:
  - 2 Health Units have each had one publicly-funded Catholic school board refuse HPV vaccination in their schools
- All HUs invite students attending non-participating schools to access vaccine through clinics held at the HU.
## Canadian HPV Vaccination Programs

<table>
<thead>
<tr>
<th>P/T</th>
<th>Program</th>
<th>Catch-Up</th>
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<tbody>
<tr>
<td>BC</td>
<td>Grade 6 (2 doses) + 1 dose in high school</td>
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</tr>
<tr>
<td>AB</td>
<td>Grade 5</td>
<td>Grade 9 (2009-2012)</td>
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<tr>
<td>SK</td>
<td>Grade 6</td>
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<tr>
<td>MB</td>
<td>Grade 6</td>
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<tr>
<td>ON</td>
<td>Grade 8 (extended eligibility to grade 9)</td>
<td>Grade 9-12 + 1&lt;sup&gt;st&lt;/sup&gt; post-secondary year (2012-2013)</td>
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<tr>
<td>QC</td>
<td>Grade 4 (2 doses) + 1 dose in high school</td>
<td>&lt; 18 years</td>
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<td>NB</td>
<td>Grade 7</td>
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<td>NL</td>
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<tr>
<td>NT</td>
<td>Grade 4</td>
<td>Grade 9-12 (2009 -2014)</td>
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<tr>
<td>YT</td>
<td>Grade 6</td>
<td></td>
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<tr>
<td>NU</td>
<td>Grade 6</td>
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Publicly funded immunization programs in Canada.
June 2012 PIDAC-I HPV Recommendations

- Move school-based HPV vaccination from grade 8 to grade 7
- Implement a “once eligible, always eligible” policy for HPV vaccine
- Implement a one-time high school catch-up program in the 2012/13 school year
- Publicly-fund Gardasil® for men who have sex with men or males who identify as homosexual up to the age of 26 years.
- Continue to use Gardasil® for women, as it offers protection against both anogenital warts, as well as HPV-related malignancies,
  - unless the cost of Cervarix meets the criteria of the economic analysis by PHO and if the use of Cervarix would result in additional female cohorts eligible to receive the vaccine.
Changes to Ontario’s HPV vaccine program

• Effective September 2012:
  • Female students can receive HPV vaccine until end of grade 12
  • One-time catch-up program (Sept. 2012 to June 2013) for females in the 2007/2008 school cohort year who are no longer in high school
Considerations and research priorities

• Strategies to improve vaccine coverage in Ontario
• Aiming for 100% participation of publicly-funded school boards
• Knowledge, attitudes and beliefs and acceptability of HPV vaccine in recipients, parents, providers
• Immunogenicity, efficacy and effectiveness of a 2-dose HPV vaccine schedule
• Impact of vaccination programs on cervical cancer screening programs
Challenges in Implementing School-Based Immunization Programs
Societal context

- Growing vaccine hesitancy in general
- New vaccine programs highly scrutinized
- Influence of media coverage
- Certain VPDs more “feared” than others
  - Immediate disease threat (IMD) increases vaccine acceptance\(^1\)
- Ontario’s infant programs delivered by HCPs
  - May have had little/no prior contact with public health unit staff

Multiple stakeholders

- Many stakeholders
  - MOHLTC, PHO, Health Units,
  - Ministry of Education, Publicly-funded school boards
  - Publicly-funded schools, Independent schools, Parents, Students

- New programs require early contact with school boards

- Requested roles of schools\(^1,2\)
  - Dissemination and collection of fact sheets/consent forms
  - Provide appropriate location for vaccination clinic

- Competing priorities at schools

Informed Consent

• Ontario Health Care and Consent Act
  • No minimum age of consent

• Health Units request informed consent from parents
  • 14/36 Health Units would give HPV vaccine to eligible girl without parental consent, if requested and judged capable of giving consent¹

• Informed consent forms distributed through students
  • Many opportunities to get lost along the way!!

• Challenging to develop
  • Product monographs change over time
  • Suitable literacy level

Ages and stages: Adolescence

• Increasing autonomy

• Importance of peer acceptance

• Anxiety pre-vaccination
  • Reduced by peer support\(^1\)?
  • Exacerbated by other anxious peers?

Mass psychogenic response to HPV vaccination: Australia

• May 7, 2007: 720 girls received HPV4 vaccine at girls school in Melbourne, Australia

• Within 2 hours: 26 girls presented to school’s “sick bay”
  • Dizziness, fainting, neurological symptoms

• 4 girls transported by ambulance to pediatric hospital
  • EKG, neuroimaging, EEG all normal
  • Seen by pediatric neurologist: “no organic basis for symptoms”

• Seen at an AEFI clinic
  • 3 received HPV4 vaccine without symptoms
  • 1 declined further doses

Mass psychogenic response to HPV vaccination: Australia

• Incident review
  • Looked for similar reports from National Immunization Committee, national body responsible for AEFI surveillance, VAERS data from US, vaccine manufacturer: none found
  • Reviewed school procedures: all followed
  • School design: quadrangle
    • Each of the 26 symptomatic girls walking to “sick bay” were in full view of all school classrooms

• Conclusion: Mass psychogenic response to vaccination

• Received international media coverage
  • Reinforces importance of AEFI investigation, risk communication

Other challenges

- Staff education and preparation
- Travel time to schools
  - Cold chain management
- Completing students for multiple dose vaccine schedules
- Documentation
  - Data entry into IRIS
  - Reporting to stakeholders
Conclusions

• School-based vaccination clinics may improve coverage
  • And may improve health equity?

• Public confidence in school-based vaccination programs requires:
  • Support of partners in education sector
  • Importance of prompt AEFI investigation and risk communication
  • May be influenced by characteristics of VPD

• Maintaining and improving coverage
  • An ongoing area of research
  • Effective communication about vaccine safety a priority
  • Requires good IT solutions to effectively monitor coverage
Acknowledgements

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