School-Based Immunization and Implementation of the CARD System

To:	Chair and Members of the Board of Health
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Recommendations

It is recommended that the Board of Health receive this report for information.

Key Points

- **Comfort, Ask, Relax, Distract (CARD)** is an evidence-based approach that helps reduce fear, pain, and stress during student vaccinations through preparation and personalized coping strategies.
- In 2023–2024, Wellington-Dufferin-Guelph Public Health (WDGPH) partnered with the University of Toronto as part of a research study to implement CARD in 29 elementary schools with lower vaccine uptake, assessing overall vaccination experience and immunization uptake
- CARD implementation in selected schools led to significant increases in coverage for all targeted vaccines:
  HPV: +9.8%; **Hepatitis B**: +8.1%; **Meningococcal (MCV4)**: +5.3%

Background

In Ontario, routine immunizations for school-aged children (ages 4 to 18) are delivered through both primary care and school-based programs. Vaccines provided in primary care settings at age four include: measles, mumps, rubella, and varicella (MMRV), as well as tetanus, diphtheria, pertussis, and polio (Tdap-IPV). In Grade 7, additional vaccines are administered by WDGPH through school-based programs and include: hepatitis B (Hep B), human papillomavirus (HPV), and quadrivalent meningococcal (MCV4).[1]

A system to manage needle-related stress, CARD, is an evidence-based framework designed to enhance the vaccination experience for students and healthcare providers by reducing stress-related responses such as fear, pain, and fainting during immunization. During the 2023-2024 school year, WDGPH partnered with the University of Toronto on a research project to implement the CARD system. All 67 public and Catholic elementary schools receiving vaccination services from WDGPH for Grade 7 students were included in the analysis. Of these, 29 schools with lower uptake for Hep B, HPV, and MCV4 vaccines were assigned to the CARD intervention group and 38 schools served as controls. The study included all Grade 7 students eligible for vaccination in the WDGPH region, representing approximately 3,500 students based on 2022-2023 enrollment. The research study is expected to be published in the Human Vaccines and Immunotherapeutics (HVI) journal in the coming year.

The implementation of CARD aimed to improve the overall vaccination experience for students while assessing its impact on immunization uptake within participating schools. This approach reflects WDGPH's commitment to equity-focused strategies that support both vaccine confidence and access in school-aged populations. Injection-related pain and fear are commonly reported adverse reactions in school-aged children undergoing vaccinations and contribute to vaccine refusal. The CARD system includes interventions that reduce pain, fear and other immunization stress-related responses. This targeted rollout provided an opportunity to evaluate the impact of CARD not only on the vaccination experience but also on vaccine acceptance, by enabling comparisons of uptake for the three targeted vaccines (Hep B, HPV, and MCV4) over time and between schools where CARD was implemented versus those where it was not.

Methods – CARD Group

Public health nurses contacted school principals to coordinate fall vaccination clinics and scheduled pre-clinic in-person student education sessions. These multimedia sessions explained the vaccines being offered and introduced students to the CARD framework, which provides coping strategies for managing needle-related stress. Students received a CARD checklist and selected preferred strategies (e.g., using distraction tools, requesting privacy, having a support person present). They also reported their baseline needle fear and fainting history. Nurses used this information to tailor clinic preparations, such as organizing vaccination order by fear level and accommodating individual preferences.

On clinic days, environmental adjustments were made to minimize fear cues - e.g., separate waiting areas, facing students away from equipment, and reducing needle visibility. Students confirmed or adjusted their chosen coping strategies, which nurses supported during both fall and spring clinics. After vaccination, students were invited to complete an optional survey on CARD's helpfulness. Nurses also completed a survey evaluating CARD's impact on student coping and the vaccination process.

Methods – Control Group (Usual Care)

In the control group, nurses contacted school principals to coordinate vaccination clinics but did not conduct pre-clinic in-person student education sessions. On clinic day, nurses reviewed the vaccines with students prior to administration. Students did not receive CARD checklists or formal opportunities to select coping strategies. While the same nurses served both CARD and non-CARD schools, some environmental or procedural elements may have been informally carried over. No post-vaccination feedback surveys were completed by students or nurses in the control group.

The study resulted in several recommendations to strengthen the effectiveness of CARD implementation in future school-based clinics, including:

1) **Strengthen pre-clinic communication with students**
   Student feedback highlighted the need for more timely and informative reminders prior to vaccination clinic days. Students expressed that receiving reminders at least one day in advance would help reduce uncertainty and enhance preparedness.

They suggested that these reminders include details such as the number of injections to be received, a recommendation to wear a short-sleeved shirt, and an estimated duration of the vaccination process. Including this information in advance communication may support a more positive and efficient vaccination experience.

2) **Support students in preparing coping strategies in advance**

Students reported that they appreciated the opportunity to ask questions and reflect on their preferred coping strategies before entering the vaccination area. During the 2023-2024 implementation, WDGPH piloted the practice of teachers replaying the CARD video prior to vaccination day and delivering a brief educational session on the morning of the clinic. However, adherence to this approach varied between schools. Given that students expressed difficulty in making coping decisions immediately before or during the clinic, it is recommended that structured preparation opportunities, such as consistent pre-clinic education, be prioritized and standardized across participating schools.

Results

As shown in Table 1, vaccine uptake within CARD intervention schools increased significantly following implementation in 2023–2024 compared to the previous year:

- **HPV**: +9.8% ($p < 0.001$)
- **Hepatitis B**: +8.1% ($p < 0.001$)
- **Meningococcal (MCV4)**: +5.3% ($p < 0.001$)

In contrast, the uptake in control schools either declined or remained unchanged:

- **HPV**: –1.1% ($p = 0.50$)
- **Hepatitis B**: –4.4% ($p = 0.004$)
- **Meningococcal (MCV4)**: –2.7% ($p = 0.03$)

These results indicate both a statistically and practically significant improvement in vaccine uptake associated with CARD implementation.

Table 1. Numbers of students vaccinated and Within Group Percentages and Differences in Vaccine Coverage Before (2022-2023) and After (2023-2024) CARD integration in CARD and Control Schools

Vaccine	2022-2023 (Before)	2023-2024 (After)	Difference over time	P-value
CARD schools	**(n=1478)**	**(n=1403)**		
Human papillomavirus**	809 (54.7)	905 (64.5)	+9.8	<0.001
Hepatitis B**	891 (60.3)	959 (68.4)	+8.1	<0.001
Meningococcal conjugate-ACYW	1133 (76.7)	1150 (82.0)	+5.3	<0.001
Control schools	**(n=1729)**	**(n=1877)**		
Human papillomavirus**	1136 (65.7)	1213 (64.6)	-1.1	0.50
Hepatitis B**	1242 (71.8)	1265 (67.4)	-4.4	0.004
Meningococcal conjugate-ACYW	1485 (85.9)	1562 (83.2)	-2.7	0.03

Values are frequency (%); * Chi squared test; ** Two doses required for series completion

As shown in Table 2, vaccine uptake rates in 2022–2023 were significantly lower in the schools selected for CARD implementation compared to control schools. However, after implementing CARD in 2023–2024, these differences were no longer statistically significant—indicating that uptake in CARD schools had improved and reached levels comparable to those in control schools.

Table 2. Between Group Differences in Vaccine Coverage Before (2022-2023) and After (2023-2024) CARD integration in CARD and Control Schools

Vaccine	CARD	Control	p-value*
Before (2022-2023)	**(n=1478)**	**(n=1729)**	
Human papillomavirus**	809 (54.7)	1136 (65.7)	<0.001
Hepatitis B**	891 (60.3)	1242 (71.8)	<0.001
Meningococcal conjugate-ACYW	1133 (76.7)	1485 (85.9)	<0.001
After (2023-2024)	**(n=1403)**	**(n=1877)**	
Human papillomavirus (HPV)**	905 (64.5)	1213 (64.6)	0.94
Hepatitis B **	959 (68.4)	1265 (67.4)	0.56
Meningococcal conjugate-ACYW	1150 (82.0)	1562 (83.2)	0.35

Values are frequency (%); * Chi squared test; ** Two doses required for series completion.

Discussion

School-based vaccination is effective but can be impacted by student fear and stress, which may contribute to vaccine refusal. The CARD system offers evidence-based strategies to improve the vaccination experience and reduce stress-related responses. In this study, WDG schools with lower vaccine uptake were assigned to receive the CARD intervention in 2023-2024. These schools saw significant improvements in uptake for all targeted vaccines (increases of 5.3% to 9.8%), while control schools showed no improvement or declines. By the end of the year, coverage in CARD schools matched that of controls.

Feedback from both students and nurses indicated that CARD contributed to a more positive vaccination experience. Most nurses observed improved student coping and reported that implementing CARD did not increase time requirements or reduce satisfaction compared to usual practice.

Health Equity Implications

- **Targeted support for lower-uptake schools**: CARD was implemented in schools with historically lower vaccination coverage, helping to close gaps in access and improve equity across the student population.
- **Person-centered approach**: By allowing students to choose coping strategies based on their needs and comfort levels, CARD supports equitable care that respects individual differences, including those with higher anxiety or past negative experiences.
- **Reduces barriers linked to fear and stress**: Addressing needle fear and immunization-related distress—known barriers to vaccine acceptance—helps reduce disparities in uptake among students who may otherwise avoid vaccination.
- **Improves access to reliable information**: Providing structured, consistent vaccine education through CARD helps ensure that all students, regardless of background, have the opportunity to understand and prepare for vaccination.
- **Data-driven resource allocation**: Identifying schools with lower uptake and directing interventions accordingly demonstrates a commitment to using data to address health inequities proactively.

Conclusion

The positive impact of CARD on vaccine uptake may reflect its focus on student preparation, trust-building, and person-centered delivery, which are key factors known to support vaccine acceptance. These findings align with previous studies showing that awareness of CARD can influence vaccination decisions.[2] This study found that integrating CARD in select schools with low uptake improved vaccination rates.

These efforts reflect WDGPH's commitment to continuous improvement in equitable, student-centered immunization delivery. WDGPH will continue to build on findings from the 2023-2024 research project by integrating CARD strategies into all school-based vaccine clinics. Further evaluation will assess the long-term impact of these strategies.

Ontario Public Health Standards

Foundational Standards

- ☐ Population Health Assessment
- ☒ Health Equity
- ☒ Effective Public Health Practice
- ☐ Emergency Management

Program Standards

- ☐ Chronic Disease Prevention and Well-Being
- ☐ Food Safety
- ☐ Healthy Environments
- ☐ Healthy Growth and Development
- ☒ Immunization
- ☐ Infectious and Communicable Diseases Prevention and Control
- ☐ Safe Water
- ☒ School Health
- ☐ Substance Use and Injury Prevention

2024-2028 WDGPH Strategic Goals

More details about these strategic goals can be found in WDGPH's 2024-2028 Strategic Plan.

- ☒ Improve health outcomes
- ☒ Focus on children's health
- ☐ Build strong partnerships
- ☒ Innovate our programs and services
- ☐ Lead the way toward a sustainable Public Health system

References

1. Public Health Ontario. Strategies to Facilitate Catch-up on Routine Childhood Immunizations. Ontario, 2022. Retrieved from Strategies to Facilitate Catch-Up on Routine Childhood Immunizations

2. Taddio A, Gudzak V, Jantzi M, Logeman C, Bucci LM, MacDonald NE, Moineddin R. Impact of the CARD (Comfort Ask Relax Distract) system on school-based vaccinations: A cluster randomized trial. Vaccine. 2022 Apr 26;40(19):2802-2809. doi: 10.1016/j.vaccine.2022.02.069. Epub 2022 Mar 29. PMID: 35365344.

3. Taddio A, Mulvey K, Gudzak V, Bucci LM, Logeman C, McMurtry CM, Trotz-Williams L, MacDonald NE. *Effect of CARD (Comfort-Ask-Relax-Distract) on acceptance of school-based vaccinations: A controlled before and after study.* Human Vaccines & Immunotherapeutics. December 2025. Retrieved from Effect of CARD on acceptance of school-based vaccinations: A controlled before and after study.