

RESEARCH ARTICLE

# Concussion Public Policy in Elementary and High Schools in Ontario, Canada: A Cross-Sectional Survey to Examine Implementation Compliance, Barriers, and Facilitators

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## ABSTRACT

**BACKGROUND:** Concussion public policies have been developed to address the burden of concussions. The aim of the present study was to examine implementation compliance, barriers, and facilitators of Canada's first concussion public policy, Ontario's Policy/Program Memorandum 158: School Board Policies on Concussion (PPM158).

**METHODS:** An electronic survey was sent to 515 randomly selected elementary and high school principals across specific geographic, language, and publicly funded school types in Ontario. Data were analyzed using both qualitative and quantitative methods.

**RESULTS:** One hundred and thirty-five principals responded to the survey (26%). Concussion education was provided to teachers in 81% of schools, to students in 83%, and coaches in 79%. Additionally, 89% reported having a return-to-learn protocol in place and 90% reported having a return-to-play protocol. Implementation barriers included difficulties in providing concussion education to parents (42%), obtaining notes from physicians, and maintaining the volume of documentation. Eighty-seven percent of respondents believed that PPM158 improves student well-being.

**CONCLUSIONS:** Identified implementation barriers and facilitators can inform concussion policy practices to improve student well-being. We recommend: (1) an appointed concussion policy lead at each school, (2) electronic documentation, (3) determining the optimal education format to improve parent/guardian education, (4) fostering relationships between schools and health care professionals, and (5) student concussion education in every grade in Ontario schools.

**Keywords:** health policy and legislation; safety and injury prevention; data-driven decision-making in school health.

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Concussions are a serious public health concern, and children and youth ( $\leq 18$  years of age) represent a subset of the population who are particularly at risk and also require age-specific management.<sup>1,2</sup> Visits to the emergency department and physicians' offices by children and youth in Ontario because of concussion increased almost 4-fold between 2003 and 2013, with 66,319 visits recorded in 2016.<sup>3,4</sup> The Ontario Student Health Survey showed that 1 in 7 students (elementary and high school) reported a concussion in 2019.<sup>5</sup> Concussions can have a significant impact on academic success. For example, elementary and high school students in Ontario who report a head injury are more than twice as likely to report poorer academic outcomes compared with noninjured students.<sup>6</sup> Similarly, other studies have shown that concussed students reported worse outcomes related to academic success, including general performance, attention, and symptom exacerbation.<sup>7,8</sup> Moreover, concussions are associated with time lost from school, and this is greater in students with post-concussion syndrome.<sup>9,10</sup>

In response to rising rates of reported concussions, including in children and youth public policies on concussion have been developed, starting in 2009 with the Zackery Lystedt Law in Washington State.<sup>11</sup> In the following 5 years, similar policies were implemented in all other US states.<sup>11</sup> In Canada, Ontario was the first province to implement a public policy on concussion via the Policy/Program Memorandum 158 (PPM158) in 2014<sup>8</sup> which was directed toward elementary and high school children and youth. The subsequent 2018 Ontario legislation on concussion named Rowan's Law included an updated version of PPM158.<sup>12</sup> Key elements of PPM158 include concussion education (CE), prevention, and management including a return-to-play protocol (RTPP) and a return-to-learn protocol (RTLTP) in the school setting. Since being introduced, PPM158 and many concussion public policies in the United States have been the subject of evaluation.<sup>13,14</sup> The studies evaluating concussion public policies in the United States have demonstrated improved awareness and greater reporting of concussion post-implementation.<sup>14</sup> However, compliance with the tenets of the policies is variable.<sup>15</sup> For example, Sullivan et al. assessed 71 schools from 26 states for compliance of school concussion policies with state concussion legislation, and found that among the schools in the study, 90% complied with the removal from play tenet, 97% complied with the RTP tenet, and 76% complied with the concussion education tenet.<sup>16</sup> Coxe assessed 71 high school policies across the United States and found that 99% complied with the RTPP tenet, 83% complied with the removal from play tenet, and 59% provided concussion education to parents and student-athletes.<sup>17</sup> These assessments

indicate that the concussion education tenet had the least compliance in the United States.

Several authors have assessed single state/multiple state concussion policy implementation, and identified important factors for successful implementation such as the use of CE tools and the timing of CE, as well as collaboration between school staff and medical professionals, centralized implementation authority, and strong communication between stakeholders.<sup>18-21</sup> Challenges in policy implementation included low rates of parent/guardian CE, lack of prevention knowledge and practice, and logistics of return-to-play and return-to-learn.<sup>18-20,22-26</sup> Barriers to implementation included stakeholder resistance, poor communication, language barriers, prohibitive cost and access to medical care, ineffective education format, and a general lack of concussion awareness.<sup>18,21,23,27</sup>

Understanding implementation compliance, barriers, and facilitators is important to inform and improve policy implementation, and researchers have identified the need for such research in the context of concussion policy.<sup>18</sup> There has been little research on concussion public policy implementation in the Canadian context, where the inclusion of a RTLTP component is a major policy difference compared to many American policies.<sup>22,28,29</sup> The purpose of the present study was to assess the compliance of Ontario school board concussion policies in terms of CE, RTPP, and RTLTP protocols, and to identify barriers to and facilitators of PPM158 implementation.

## METHODS

### Design

A cross-sectional survey design was used to gather information on implementation compliance, barriers to, and facilitators of concussion policies in Ontario elementary and high schools in response to PPM158.

### Instrumentation

An online survey of school principals was used to gather data on school concussion policies and perceived barriers and facilitators related to implementation of PPM158. A draft survey was evaluated for coherence, feasibility, and comprehensiveness by a focus group of principals from across Ontario ( $n = 8$ ). The focus group suggested survey modifications to improve applicability to the target population, eliminate redundancies, and enhance feasibility of completion. The final survey comprised 60 open-ended and multiple-choice questions and was available in both official languages (English and French). The OMOE also reminded school boards to communicate with their constituent schools about the study. Participants were informed that the survey data results would be anonymous and aggregated.

Given that education, prevention, and management (return-to-learn and return-to-play) are key elements of PPM158, the survey focused on implementation practices related to these areas. For example, survey data were collected on the frequency and timing of CE provided at each school, as well as on the intended audience, eg, coaches, teachers, administrative and support staff, parents/guardians, or students. Information was gathered on return-to-learn and return-to-play protocols, and concussion prevention initiatives such as the use of permission forms and surveillance of concussion events.

### Participants

The sampling frame for the survey was all publicly funded elementary and high schools in Ontario (N = 5744). Stratified sampling by school board type (Public and Publicly funded Catholic), location (6 geographic regions delineated by the Ontario Ministry of Education), and language (French and English) was conducted to ensure a broad representation of schools from across the province to maximize generalizability. Approximately 10% sampling of each of the 24 strata generated a sample of 515 randomly selected schools to whom the survey was sent. At an alpha level of 5%, a sample size of 515 provided 95% confidence intervals of  $\pm 4\%$  around proportion estimates. A 8% difference in proportions between groups was considered a minimally important difference, based on our previous pilot study.<sup>26</sup> We utilized this stratified method to obtain as representative a sampling as possible of the entire province. These decisions were made in consultation with stakeholders involved in concussion public policy in Ontario.

### Procedure

The survey was sent to school principals by email, with regular email reminders over the course of 4 months, and principals. Principals were asked to fill in the form themselves or to delegate the responsibility to the staff member at the school who was most familiar with the school's concussion policies. We do not know the percentages of returned forms that were completed by principals or by other staff, and therefore, we refer to them as "respondents." The survey platform was Google Forms, and each respondent was limited to one response. Approval for the study was provided by the University Health Network Research Ethics Board.

### Data Analysis

Both quantitative and qualitative data were collected, and were analyzed using quantitative and qualitative methods. Quantitative data were analyzed using descriptive statistics and an omnibus test followed by 2-tailed multiple pairwise comparison tests

with Bonferroni correction to minimize Type I error. Qualitative data from the open-ended survey questions were analyzed within a postpositivist paradigm, using inductive thematic analysis, as described by Braun and Clarke.<sup>30</sup> To facilitate cross-checking, 2 concussion researchers familiar with concussion policy research independently coded the data. Specifically, the coding reliability approach of thematic analysis was conducted. Coding began with an initial open coding phase in which coders independently developed codes, followed by a coding meeting in which to assess saturation and achieve consensus regarding the coding scheme prior to formal coding. Coding was data-driven using descriptive codes linking to stakeholder roles, whether comments related to a barrier or facilitator, and specific aspects of concussion policy such as concussion education and prevention. Following formal coding, the coders met again to determine intercoder reliability and achieve consensus on any remaining disagreements. Cohen's kappa was calculated to describe intercoder reliability, and was 0.84. Rating was used in coding and was conducted as per the Consolidated Framework for Implementation Research, wherein ratings are based on valence (positive, negative, or neutral) and strength or magnitude (determined by the level of concurrence among data, strength of language, and use of examples). Theme finalization resulted in the barriers and facilitators listed in Table 2.

## RESULTS

### Response Rate and Respondent Characteristics

There were 135 respondents to the survey (26% response rate). At an alpha level of 5%, given the resulting sample size of 135, 95% confidence intervals were of  $\pm 8\%$  around proportion estimates. Of the survey respondents, 68% were from public schools, 73% were from English-speaking schools, 53% were elementary schools, and 64% were from urban localities. The definition of "urban" used was the Statistics Canada definition wherein "urban" signifies a population of at least 1000 and a density of 400 or more people per km<sup>2</sup>.<sup>31</sup> Response rate per stratum ranged from 17% to 100%. Table 1 compares the characteristics of survey respondents and nonrespondents. Respondents and nonrespondents were comparable by language, school type, locality, and school level.

### Concussion Education

Figure 1 shows concussion education by stakeholder group. Approximately 80% of students, teachers, and coaches received CE provided by the school at least once per year. Many schools reported that trainers and referees were often provided CE through their certifying organization rather than

**Table 1. Characteristics of Survey Respondents and Nonrespondents**

Characteristic		Respondents (n = 135) n (%)	Nonrespondents (n = 380) n (%)
Language	English	98 (73)	302 (79)
	French	37 (27)	78 (21)
School type	Public	92 (68)	238 (63)
	Catholic	43 (32)	142 (37)
Locality	Urban	87 (64)	255 (67)
	Rural	48 (36)	125 (33)
School level	Elementary	72 (53)	217 (57)
	High	46 (34)	110 (29)
	Combination	17 (13)	53 (14)

through the school. Pairwise comparisons (Bonferroni corrected) demonstrated that parents/guardians were significantly less likely to receive CE compared with students, teachers, and coaches (58% vs 83%, 81%, and 79%, respectively,  $p < .001$  for all). School administrative staff were significantly less likely to receive CE than students (68% vs 83%,  $p < .004$ ). All statistically significant differences were greater than the minimally important difference of 8% based on our previous pilot study.<sup>26</sup>

The most common format of CE for teachers was staff meetings, however, approximately 50% of schools used multiple educational formats (eg, PA Day workshops, certifications via courses, and staff meetings). Most coaches received CE prior to the start of seasonal athletic activities, and in multiple formats. Parent education was provided most frequently through print material, eg, brochure/newsletter or online, eg, school website. However, 42% of responding schools indicated that parents/guardians were “never” provided CE.

Only one quarter of schools believed that parents/guardians were well-informed about concussions. Principals perceived that the more informed parents/guardians were those whose children participated in sports and/or those whose children had experienced a concussion. The health or physical education teacher provided CE to students at two thirds of schools (67%). Virtually all principals (97%) reported that their school board had informed them about PPM158 prior to receiving the survey. Most schools were also provided with materials by their school board to support CE (78%).

### Return-to-Learn Protocol

Most schools (89%) had a RTLP in place, defined as a series of steps for the student to undergo to manage their concussion and return to regular learning activities.<sup>32</sup> Most schools (82%) required a medical note as part of their RTLP (82%), and only 3% of principals specified that return-to-learn occurred with

parental consent alone. Most schools (79%) specified the individual responsible for implementation of each step of the RTLP. Two-thirds of schools had a strategy for communication with families about concussion management protocols during a student’s recovery.

### Return-to-Play Protocol

Most schools (90%) had a return-to-play protocol (RTPP). Similar to RTLPs, most schools (85%) required a doctor or nurse practitioner’s note for return-to-play, and the individual responsible for implementation of specific steps in the RTPP was specified at most schools (79%).

### Prevention

More than half of all principals required that a permission form (PF) with information about concussions be signed by a parent/guardian prior to student participation in any curricular or extracurricular activities with an increased risk of concussion (eg, sports, dance, and other physical activities). When PFs were used, 52% did not require students to sign them in addition to parents/guardians. Principals were asked if they thought that signed PFs help in concussion prevention and education; 79% responded “yes.”

Fifty-nine percent of principals used some method of surveillance to track the frequency of concussions in their schools (one-fifth of whom used the Ontario Student Record), whereas 39% reported that they did not track concussions at their school. Surveillance results were used mostly for planning, communication with parents and/or teachers, understanding concussion patterns, and tracking students through RTLPs or RTPPs.

### Compliance

In terms of compliance, 83% of schools provided students with CE at least once a year, 81% for teachers, 79% for coaches, 68% for administrative staff, and 58% for parents (Figure 1). Eighty-nine percent of schools had an RTLP, 90% of schools had an RTPP, and more than half of schools used permission forms prior to participation to promote concussion.

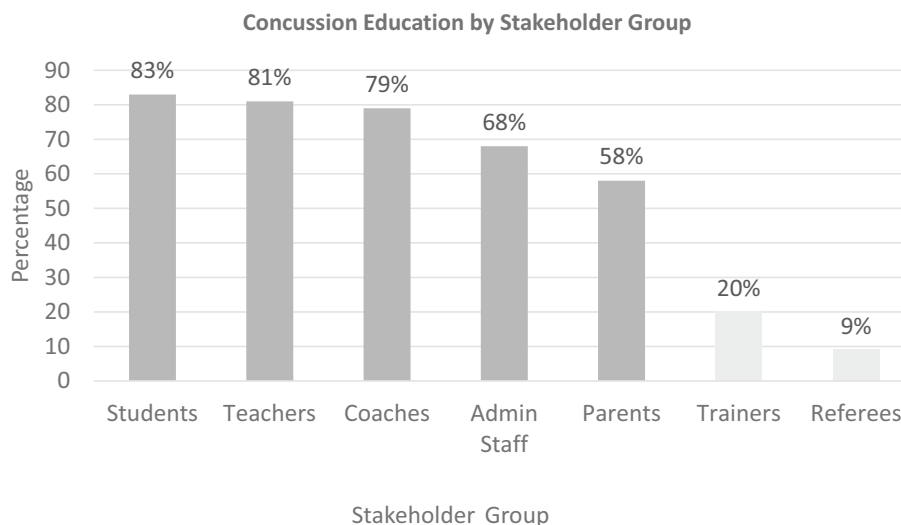
## REPORTED BARRIERS AND FACILITATORS TO IMPLEMENTING PPM158

### Barriers

**Implementation of PPI58 components.** More than half of respondents indicated challenges with implementation of PPM158 across 5 themes: (1) Communication challenges with families, eg, unwillingness of the family to engage, language barriers, failure to provide medical information (diagnosis or symptoms); (2) Difficulty obtaining physician or nurse practitioner



Figure 1. Stakeholder Groups That Receive Concussion Education At Least Once Per Year. Trainers and Referees are Shaded Differently, as These Groups Usually Receive Concussion Education From Sources Other Than the School



notes; (3) Poor communication between school staff; (4) Burden of paperwork; and (5) Students unwilling to report their own concussions because of concern they would be excluded from sport or that they would miss opportunities for scholarships.

**Obtaining “medical notes”.** Respondents were asked specifically about difficulties faced by families obtaining RTLP or RTPP notes from a physician or nurse practitioner. Approximately half reported several challenges. The main challenges included: (1) the financial cost of a “medical” note from a health care provider (eg, fee for a note, transportation to health care provider, wages lost for time away from work); (2) the time lost from school (for the student) and work (for the parent) to attend an appointment; (3) difficulty in accessing a family physician and/or specialist; (4) language barriers for immigrant families; and (5) a disconnect between school policy expectations and what the physician provided in the note.

### Facilitators

About one-quarter of respondents identified facilitators across 8 themes. These included: (1) High level of staff awareness and adherence to concussion protocols; (2) Consistent and frequent communication with families and students (email, telephone, and direct); (3) Concussion surveillance; (4) Consistency in implementation; (5) Follow-up with students to ensure safe return-to-play or return-to-learn; (6) Accessibility of concussion protocol materials for staff; (7) Streamlining communications/responsibilities to one person/identification of staff member responsible; and (8) use of additional resources (eg, concussion physician in the neighborhood, liaisons with their

schoolboard Athletic Director, and Ontario Physical and Health Education Association materials).<sup>32</sup>

Table 2 shows direct quotes from respondents on barriers and facilitators to the implementation of PPM158 based on responses to the open-ended survey, alongside the themes developed through explanatory thematic analysis.

Respondents also shared suggestions to improve implementation: (1) developing relationships with local sports medicine or family physicians, (2) an appointed concussion lead at the school to streamline communication, and (3) online documentation to improve the paperwork process.

Finally, most (87%) of principals believed the concussion policy helped improve student health, while 11% did not, and 2% were unsure. Of those who believed it was not helpful, 4 (27%) indicated that it was too much work, it caused teachers to be so worried about concussions that they would not volunteer for extracurricular activities, or that the perceived paucity of concussions at their schools made the policy irrelevant to them.

### DISCUSSION

To our knowledge, this is the first assessment (in both official languages) of the implementation of PPM158 across Ontario, Canada. Students (83%), teachers (81%), and coaches (79%) received concussion education in the school setting more often than parents/guardians (42%). Eighty-seven percent of schools reported having a return-to-learn protocol (RTLP) in place and 90% reported having a return-to-play protocol (RTPP). Implementation

Table 2. Barriers and Facilitators to PPM158 Implementation: Themes and Respondent Quotes

Theme	Example Quote
Barriers (54% of respondents reported barriers to concussion policy implementation) Communication challenges with families (lack of family engagement and communication)	<p>"Parents are not fully forthcoming with information when concussions occur."                      "It's difficult to have communication and also the documents returned from the family (we are chasing students for them)."                      "Parents do not take it seriously enough in many cases."                      "It is hard to get families to keep up with communicating the various steps . . . often families want their child back to school and do not realize that we must have these forms in place. People are busy and working and it can be hard to get medical signatures . . . often parents want to simply indicate, with their permission, that the student is ready to return and/or move between the steps of the return to learn plan."                      "Often parents will not report concussions received in community and we have to find out through other means and reach out to them to ensure they follow process."                      "Oui, le suivi continu des parents, c'est difficile."                      "Parfois la langue française est difficile pour les parents."                      "Lack of follow-through/understanding of the policy by medical professionals, especially regarding timely turn-around with notes and follow-up visits."                      "The issues are access to a doctor or nurse practitioner, cost to the family, time off work for parents to take their child to the doctor, missed school time waiting on the note."                      "YES (there are challenges)! Access is a problem and some doctors do not know the protocol and just verbally inform parents to inform the school."                      "Oui, les médecins de famille ne sont pas toujours connaisseant."                      "Parfois, les parents ne veulent pas retourner voir le médecin car souvent il y a un coût pour une note du médecin."                      "In a busy school, it is hard to keep everyone informed."                      "Because of the number of people involved in the education of any student at the school, not everyone is always aware of what's going on and what part of the protocols are happening."                      "There are lots of steps (in the protocol), so it's hard for everyone to be able to monitor each step with a large student body."                      "It's tough to have all staff aware - ie, even supply teachers, etc."                      "It is a lot of paperwork and it could be more efficient - online system rather than paper."                      "They are just time consuming. I sometimes administer more than 10 concussion protocols per day."                      "Having to document all of them is really a burden, and it ends up taking too much time when we have to deal with other priorities, too."                      "If you are on sport field and child hurt, you are to fill out concussion form. But these are not duplicate forms, meaning you either need to fill in a second copy for your own records or find a photocopier to copy this. And that is just the beginning."                      "There are many challenges but the biggest is TIME—there are many concussions to keep track of now and this is hard to manage. Additionally, the current policy/protocol requires us to track paperwork even if we do not necessary believe that there is a concussion, to be on the safe side. While this is understandable, it is time-consuming."                      "The workload is unmanageable for admin who end up being responsible for all of it."                      "Having the older students 'admit' and share when an injury or possible injury has happened. Quite often they want to keep playing and hide symptoms and it takes the adults to pull out the information."                      "Challenging steps include . . . when students fail to report symptoms to the teacher."                      "Students often want to start playing sports too quickly or do not want to sit out so they hide it."                      "A challenge is when the students who have concussions acquired them outside of school. Many choose not to disclose so they can participate in school sports."                      "Oui, il arrive que l'élève s'obstine et veut retourner au jeu ou il cache ses symptômes."</p>
Difficulty obtaining physician or nurse practitioner notes	
Poor communication between school staff	
Burden of paperwork	
Students unwilling to report their own concussions	

Table 2. Continued

Theme	Example Quote
Facilitators (26% of respondents reported facilitators of concussion policy implementation) High level of staff awareness and adherence to concussion protocols	<p>"At our school, our teachers and admin have attended our (schoolboard's) Concussion Conference and their understanding of concussion has grown exponentially since then. They came back and shared their knowledge with all staff and it was extremely impactful."</p> <p>"Since we started having these protocols, staff have become very aware of the steps and what to do, so that's helped the process."</p> <p>"I've seen a lot more go smoothly lately, and I think that's because our teachers and admin both stick to the steps in the protocol."</p> <p>"There are many variables at play between detections, reporting, return to learn, return to play. With PPM158, the knowledge has improved and the school's staff has improved in their overall awareness."</p>
Consistent and frequent communications with families and students	<p>"All staff know to review with office if students involved in head injury, regardless of severity."</p> <p>"We monitor and communicate with parents about the students' concussion progress."</p> <p>"An immediate phone call to parents helps. During the protocol, we communicate progress of the students."</p> <p>"Communication is key when dealing with a student who has a concussion. It is done often throughout the protocol process."</p> <p>". . . la belle collaboration entre nos parents et notre école."</p>
Concussion surveillance	<p>"Tracking has assisted us when a concussion did not show up until a few weeks later."</p> <p>"Keeping track of concussions helps us know which students need accommodations especially with such a large student body."</p> <p>"Tracking has assisted us when a concussion did not show up until a few weeks later."</p>
Consistency in implementation	<p>"With each concussion experience we are getting better and better at following the protocol consistently, so more students' concussions are being properly addressed and getting support."</p> <p>"We have definitely seen improvements at our school with consistency. Our staff have become quite good at following the protocol."</p> <p>"I think when we follow the protocol the same way between cases it helps us make sure that the students are all getting support when they need it."</p>
Follow-up with students	<p>"With each concussion experience we are getting better and better at following the protocol."</p> <p>"Yes, the success at our school is consistently screening after an injury . . . to identify concussions and prevent/reduce further symptoms."</p> <p>". . . (we) support students and check on them as each semester begins."</p> <p>"We follow-up with students who have gone through the protocol, to make sure they have support that they need."</p> <p>"We do check-in with students when they have had a concussion, because they might need some extra accommodations. This is especially important transitioning to a new semester."</p>
Accessibility of concussion protocol materials	<p>"The concussion protocol sheets are available right at the entrance to the office."</p> <p>"We make sure the concussion materials are accessible to every staff member."</p>
Streamlining communications/responsibilities to one person	<p>"The concussion sheets are available in multiple places, and we have posters about it posted in the school."</p> <p>"Streamlining the information to one person who can liaise is very helpful in a secondary school."</p> <p>"In a high school there are many people involved in any given student's education and day. Some of the time, not everyone is aware of the teams a student is part of. We attempt to streamline things by having one staff member (a guidance counselor) track and monitor all concussions and liaise between families and the teachers/coaches, and this helps."</p> <p>"It's a lot easier to keep things moving when there's one staff member leading the team, and who's responsible to know all the protocol details."</p> <p>"We have one person liaise between school and the family and this is a guidance counselor. This is helpful in a high school . . ."</p>
Use of resources	<p>"Having ONE person (vp) monitoring and tracking all concussed athletes is critical for consistency and accuracy."</p> <p>"We have a concussion specialist doctor that has her office located just down the street from the school. If students do not have a family doctor then she will see them. She has also volunteered to present to parents."</p> <p>"We use the OPEHA concussion protocol package across our board."</p> <p>"Our Board has been very proactive in providing resources and training that we use in our school."</p> <p>"It has been a joint venture led by our Board's Athletic Coordinator!"</p>

barriers included difficulties in providing concussion education to parents, obtaining notes from physicians, and managing the volume of documentation. Eighty-seven percent of respondents stated that PPM158 improves student well-being.

Several findings in our study align with those identified in evaluations of American state policies on concussion as well as previous research on PPM158 in a single school board district.<sup>15,18-20,23,26</sup> For example, providing concussion education to parents was a key challenge reported in our study, with 42% of respondents never providing parents with CE and many others experiencing challenges reaching parents. Taken together, the quantitative findings that parents are not adequately reached with concussion education and the qualitative findings of challenges that schools face in reaching parents and that parents face in managing concussion events demonstrate that the issue of parental concussion education is multidimensional. Challenges in reaching parents are due to inconsistent communication to parents as well as low engagement in current efforts such as information events. This is similar to previous findings in Canada and the United States.<sup>18,23,26,33-37</sup> White et al. (2017) noted that there was a lack of parental support for concussion policy, in particular removal from play based on lack of knowledge about concussions, which aligns with the finding of our study that some principals believe that parents sign PFs simply to ensure that students can participate in sport.<sup>37</sup> We found that the most common format of parent/guardian education was print or online material. The literature is equivocal regarding the optimal educational format for parents/guardians and other stakeholder groups—Coxe et al. noted that information sheets were not as effective as interactive formats such as in-person meetings/works and individual discussions, whereas LaBond et al. found that parents reported factsheets as the most helpful format.<sup>18,38</sup> More research is needed to determine which format is most useful, and we concur with Wallace et al. that CE should reflect the needs of the community, and furthermore, the specific stakeholder group.<sup>39</sup>

Health professionals' knowledge is also an area for improvement identified by respondents in both our study and others', including knowledge of concussion policy and its requirements concerning return-to-activity notes in various jurisdictions.<sup>33,37,40,41</sup> Pike et al. noted that fostering relationships with health care professionals is useful, as it facilitates consistency in understanding regarding policy requirements, which aligns with one of our findings.<sup>42</sup> Coaches, however, were found to be well-reached with CE in Ontario at 79%, as were coaches in Washington State.<sup>34</sup> Other common barriers to implementation of concussion policy in our study such as poor communication and

the cost associated with and access to medical care were also reflected in studies assessing American state laws.<sup>18</sup>

Currently, the individuals responsible for concussion surveillance in Ontario schools are staff with many other priorities and responsibilities. Some respondents suggested a centralized, online approach to improve the efficiency of surveillance and reduce the workload burden, which was a problem also identified by O'Hara et al.<sup>36</sup> An example of online concussion surveillance in high schools in the United States is the High School Reporting Information Online database modeled after the NCAA Injury Surveillance System.<sup>43</sup> While concussion surveillance was included in Rowan's Law in Ontario, there is no central electronic surveillance system available to schools to streamline the process, alleviate the burden of paperwork expressed by principals, facilitate communication of concussion history between grades and schools for individual students, and facilitate evaluation of concussion policy at the individual school level. Other gaps that remain include CE for high school students who do not enroll in the optional physical education class. The grade 1-8 Ontario Health and Physical Education Curriculum has been updated to include more concussion-related education, and grades 9-12 (high school) also have new concussion prompts in their Health and Physical Education Curriculum - but Health and Physical Education is still not a mandatory class for all secondary school grades.<sup>12</sup> Further, some parents and students received CE only after the student was concussed. The opportunity for primary prevention of concussions is lost if students and parents/guardians aren't informed and aware.

Despite these challenges, a majority of respondents indicated that they believed that concussion policy benefits student health, a sentiment that Howland et al. also found in their examination of the Massachusetts concussion policy, where school nurses and athletic trainers felt that the policy empowered them to manage student concussions.<sup>33</sup> Athletic Directors in the same state were reported to rate the state law a 9.2 on a 10-point scale in terms of how important the law was for student safety.<sup>28</sup> Compliance with policy requirements such as return-to-play and return-to-learn protocols was high in our study in Ontario, and similar results were found in Sullivan et al.'s 2020 assessment of high schools' compliance to RTP protocols in over half of American states.<sup>16</sup> Thompson et al. noted that only 8 state laws require return-to-learn protocols, whereas all publicly-funded elementary and high schools in Ontario are required to implement both RTPPs and RTLPs.<sup>44</sup>

Study strengths included a broad range of participants, representing schools of both official languages, rural and urban regions, elementary and high schools, and Public and publicly funded Catholic schools. The



study is also the first to incorporate both English and French data in thematic analysis to identify barriers to and facilitators of implementation. A major limitation is the response rate, which may be related to the timing of the distribution of the survey to schools (summer and fall). As with any survey, there may be response bias. In other words, respondents may have had a vested interest in concussions, which would be reflected in how policy was implemented at their schools compared to those who did not respond. While the study included a broad range of participants, findings may not necessarily be generalizable across North America.

Future research may address these limitations, as well as exploring further how educators felt PPM158 and other policies improve student wellbeing.

## IMPLICATIONS FOR SCHOOL HEALTH

The results of this study may be used to improve school health by informing decision-making in implementation of concussion policy. Specifically, the results can mitigate barriers and promote successful student outcomes by incorporating facilitators to improve efficiency, avoid staff frustration, and help students have an improved concussion recovery experience and transition back to school activities.

We recommend 5 specific and direct policy changes that can be implemented at the school level: (1) streamline communication by appointing an individual or a small team in every school as lead(s) for consistency and accuracy, (2) document concussions in a central electronic concussion surveillance system to facilitate prevention strategies and evaluate policy, (3), support research to determine the optimal format for education of specific stakeholder groups and how to support parent/guardian and administrative staff concussion education, (4) support relationships between health professionals and schools/school boards, and (5) include concussion education for all grades of students prior to potential exposures to improve the opportunity for concussion prevention.

We suggest that the Ministry of Education in Ontario and school boards can work together to create a systematic, province-wide approach to the electronic surveillance of concussions, which would ensure consistency of reporting and allow provincial, national, and international, comparison of school concussion data. Additionally, health care professional awareness and knowledge of concussion policy may be enhanced by including this group in awareness campaigns and emphasizing the importance of health care professionals in the language of the policy.

These changes can be implemented or supported at the school level, and furthermore, the Ministries of Education and Health in Ontario (and any jurisdiction in which a concussion public policy is implemented)

can address these improvements through policy change. Precedent has been set for policy change in this context to improve implementation. For example, Yang et al. identified that reporting of recurrent concussions was lower in states that had multiple revisions to concussion public policy, indicating that ongoing revisions may address gaps in existing policy and lead to better health outcomes.<sup>45</sup> McGowan-Lowrey et al. also noted that certain states amended their policies to the needs of their constituents, such as mandating parental CE.<sup>21</sup>

More research, however, is needed to identify policies and practices that are most effective for diverse stakeholders relevant to concussion prevention and management.

## Human Subjects Approval Statement

Approval for the study was obtained from the University Health Network Research Ethics Board. The IRB application number was 16-6086.

## Conflict of Interest

All authors declare no conflicts of interest.

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