

A Provincial Standardized Pediatric Massive Hemorrhage Protocol for Community or Tertiary Care Settings

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Background: In children, massive hemorrhage is a leading cause of preventable death in trauma and surgical cardiac arrest.^{1,2} In Ontario, there is limited availability/access and use of standardized pediatric massive hemorrhage protocols (MHPs), particularly in community hospitals.³ The Ontario Regional Blood Coordinating Network (ORBCoN) sponsored a multi-disciplinary steering committee (SC) to develop and roll-out an Ontario province-wide standardized MHP and toolkit for adults and children, for care in both settings with/without the availability of frozen plasma (FP).

Methods: The content of the Ontario MHP was informed by a previously published modified Delphi technique that developed 42 evidence-based principles and 8 quality metrics for a MHP.⁴

From August 2019 to March 2021 a 12-member pediatric working group (WG), selected by the SC, with tertiary care and community hospital experience and clinical expertise in anesthesia, trauma, surgery, nursing and transfusion medicine was tasked to develop pediatric MHP tools and resources for the Ontario toolkit that included side-bars for related adult section content and pediatric-specific MHP algorithms and associated learning aids (e.g. infographics and blood component/drug dosing table), a simulation video, a nursing check-list and care team hand-over tools. Pediatric topics requiring further elaboration were included in a dedicated pediatric chapter. The MHP material was presented virtually to relevant stakeholders at an educational forum in April 2021.

Results: Pediatric topics identified in need of further elaboration in a dedicated chapter including associated recommendations (see table 1) highlighted team composition, MHP activation criteria, early administration of tranexamic acid, lab testing (glucose, calcium and magnesium), strategies to administer FP and platelets, indications for hemostatic adjuncts and mitigation measures for hypothermia and hyperkalemia. Eight quality-metrics were identified including three intended for Provincial reporting i.e. timely administration of tranexamic acid and red blood cells and rapid transition to group specific blood components. The MHP and toolkit contents are available electronically from the ORBCoN website.⁵

Discussion: This initiative aims to standardize MHP activation and management for children in the province of Ontario, Canada. It provides a comprehensive, practical and contemporary approach to care that can be adapted to clinical settings with and without FP availability. The

unique aspects of children, including distinct physiology and smaller body habitus, mechanistic differences in trauma and a greater predisposition to hypothermia and hyperkalemia are considered.

Conclusions: Implementation of the pediatric MPH is expected to improve processes and patient outcomes and reduce both patient complications and clinical provider cognitive load.

References:

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Table 1. Key recommendations for a pediatric massive hemorrhage protocol

	Recommendation
R1	Maximize interdisciplinary experience and rapidly initiate transfer to a pediatric definitive care setting.
R2	Triggers for MHP activation should be based on both the volume and timing of administered red blood cells.
R3	Counter measures should be implemented early to avoid hypothermia.
R4	Tranexamic acid should be administered early in the bleeding pediatric trauma patient.
R5	Consider additional requirements for blood sample drawing, processing and variables monitored in children.
R6	Administer blood products and crystalloids on a per kg basis to avoid fluid overload
R7	Blood product resuscitation targets in children are similar to adults.
R8	Avoid premature administration of frozen plasma and platelets
R9	Fibrinogen concentrate is first-line for fibrinogen replacement and use factor concentrates in settings where frozen plasma is unavailable

