

BMJ Open Clinical practice guideline recommendations for paediatric injury care: protocol for a systematic review

Lynne Moore,^{1,2} Gabrielle Freire,³ Anis Ben Abdeljelil,² Melanie Berube ,^{2,4} Pier-Alexandre Tardif ,² Eunice Gnanvi,² Henry Thomas Stelfox,⁵ Marianne Beaudin,⁶ Sasha Carsen,⁷ Antonia Stang,⁸ Suzanne Beno,⁹ Matthew Weiss ,^{2,10} Melanie Labrosse,¹¹ Roger Zemek ,¹² Isabelle J Gagnon,¹³ Emilie Beaulieu,¹⁴ Simon Berthelot,² Terry Klassen,¹⁵ Alexis F Turgeon ,^{2,16} François Lauzier,^{2,16} Ian Pike,¹⁷ Alison Macpherson,¹⁸ Belinda J Gabbe,¹⁹ Natalie Yanchar²⁰

To cite: Moore L, Freire G, Ben Abdeljelil A, *et al*. Clinical practice guideline recommendations for paediatric injury care: protocol for a systematic review. *BMJ Open* 2022;**12**:e060054. doi:10.1136/bmjopen-2021-060054

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2021-060054>).

Received 10 December 2021
Accepted 05 April 2022



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

Correspondence to

Dr Lynne Moore;
lynne.moore@fmed.ulaval.ca

ABSTRACT

Introduction Evidence suggests the presence of deficiencies in the quality of care provided to up to half of all paediatric trauma patients in Canada, the USA and Australia. Lack of adherence to evidence-based recommendations may be driven by lack of knowledge of clinical practice guidelines (CPGs), heterogeneity in recommendations or concerns about their quality. We aim to systematically review CPG recommendations for paediatric injury care and appraise their quality. **Methods and analysis** We will identify CPG recommendations through a comprehensive search strategy including Medical Literature Analysis and Retrieval System Online, Excerpta Medica dataBASE, Cochrane library, Web of Science, ClinicalTrials and websites of organisations publishing recommendations on paediatric injury care. We will consider CPGs including at least one recommendation targeting paediatric injury populations on any diagnostic or therapeutic intervention from the acute phase of care with any comparator developed in high-income countries in the last 15 years (January 2007 to a maximum of 6 months prior to submission). Pairs of reviewers will independently screen titles, abstracts and full text of eligible articles, extract data and evaluate the quality of CPGs and their recommendations using Appraisal of Guidelines Research and Evaluation (AGREE) II and AGREE Recommendations Excellence instruments, respectively. We will synthesise evidence on recommendations using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) Evidence-to-Decision framework and present results within a recommendations matrix.

Ethics and dissemination Ethics approval is not a requirement as this study is based on available published data. The results of this systematic review will be published in a peer-reviewed journal, presented at international scientific meetings and distributed to healthcare providers.

PROSPERO registration number International Prospective Register of Systematic Reviews (CRD42021226934).

Strengths and limitations of this study

- We will produce a metasynthesis of clinical practice guidelines (CPGs) recommendations using a recommendations matrix.
- Our search strategy is not designed to identify CPGs that do not specifically target paediatric injury care populations.
- CPGs from low-income and middle-income countries were not considered but will be reviewed in future work.

INTRODUCTION

Injury is the condition that causes the greatest burden of morbidity and mortality for children in most high-income countries.¹ In the USA, the child mortality rate due to injury increased by 12% between 2013 and 2016² and according to a 2016 report, more than 7% of children suffer a significant head injury before the age of 17 years.³ In Canada, 900 children and adolescents die and 35 000 are hospitalised yearly following injury, with costs of over \$4 billion.⁴ The human and societal burden of childhood injury is even greater. For every child who dies from an injury, 10 survive with lifelong disabilities resulting in enormous emotional and financial hardship for the injured and their families. In a 2017 UNICEF report,⁵ Canada and the USA were, respectively, ranked 29th and 36th out of 40 affluent nations for protecting the well-being of children and injuries were cited as the no. 1 threat to that well-being.

Many clinical practice guidelines (CPGs) of paediatric injury care exist, all with the common objective of improving care and outcomes. However, a systematic review of quality indicators for paediatric trauma care

suggested deficiencies in the quality of care for 8%–45% of patients.⁶ Lack of adherence to evidence-based recommendations may be driven by lack of knowledge of CPGs, heterogeneity in recommendations or concerns about their quality.⁷ A synthesis of CPG recommendations is needed to clarify standards of care. Our objective is thus to systematically review CPG recommendations for paediatric injury care and appraise their quality.

METHODS

Our research question was formulated using the population; intervention(s); comparator(s), comparison(s) and (key) content; attributes of eligible CPGs; and recommendation characteristics framework⁸ in collaboration with our interdisciplinary and intersectorial project advisory committee comprising 12 Canadian paediatric injury care clinicians (prehospital, emergency medicine, trauma surgery, neurosurgery, orthopaedics, critical care, nursing and rehabilitation specialties), 3 paediatric trauma programme medical directors (MBeaudin, NY, SBeno) and 2 trauma accreditation agency representatives. This protocol was developed using methodological guidelines for systematic reviews of CPGs⁸ and Cochrane guidelines on systematic reviews⁹ and is reported according to the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols statement.¹⁰

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Eligibility

We will consider CPGs including at least one recommendation targeting paediatric injury populations on any diagnostic or therapeutic intervention from the acute phase of care with any comparator developed in high-income countries in the last 15 years. CPGs are defined as ‘statements that include recommendations intended to optimise patient care that are informed by systematic review of evidence and an assessment of benefits and harms of alternative care options’.¹¹ Paediatric injury populations are defined as children <19 years of age seen in the emergency department (ED) or admitted to hospital following injury. We will also consider CPGs that target injury care for all ages if they include at least one recommendation specific to children as well as CPGs on paediatric health-care if they include at least one recommendation specific to acute injury care. We will exclude CPGs exclusively pertaining to burns, poisoning, foreign body ingestion, late effects of injury or drowning. Finally, we will exclude publications reporting data on the implementation of or adherence to CPGs published previously but will use them to identify any additional CPGs. No restrictions based on language will be applied.

Search strategy

We will systematically search Medical Literature Analysis and Retrieval System Online (MEDLINE), Excerpta

Medica dataBASE (EMBASE), Cochrane library, Web of Science and ClinicalTrials from 1 January 2007 to a maximum of 6 months prior to publication. We will also search the websites of organisations publishing recommendations on paediatric injury care, established in consultation with our advisory committee (including injury guidelines for all age groups with specific recommendations for children and CPGs on paediatric health-care if they include at least one recommendation specific to acute injury care) described above (see [table 1](#) for a preliminary list).

Our search strategy will be developed with an information specialist using the 2015 Peer Review of Electronic Search Strategies guideline statement.¹² Our search strategy will be developed using keywords covering combinations of search terms under the themes pediatrics, injury and clinical practice guidelines. MeSH (MEDLINE) or Emtree (EMBASE) will also be used when appropriate. The search strategy will then be adapted to other databases. Using a preliminary search strategy (from 1 January 2007 to 13 September 2021; [table 2](#)), we have identified 8358 citations, including all 4 sentinel articles identified a priori.^{13–16}

Study selection

We will manage citations using EndNote (V.X9.3.3, Thomson Reuters, New York City, 2018) software. In the first phase, pairs of reviewers will independently screen titles and abstracts for eligibility. In the second phase, we will assess full texts to determine eligibility for final inclusion and record reasons for exclusion. In the third phase, we will assess the eligibility of recommendations within eligible CPGs. We will first pilot each phase on samples of 1500 citations until acceptable agreement is reached ($\kappa > 0.8$). If duplicate CPGs are identified, we will only include the most recent version. For each CPG identified, we will locate the supporting documents (eg, methodological details). Another reviewer will independently verify the completeness of each document set.

Data extraction

We will develop a standard electronic data abstraction form and a detailed instruction manual. This form will be piloted on a representative sample of five publications. Pairs of reviewers with methodological and content expertise will independently extract data from eligible CPGs. For each recommendation within CPGs, we will extract information on the population, intervention, comparator, quality of evidence and strength of recommendations. We will contact the contributing authors if important information is missing or unclear.

Quality

Two reviewers with content expertise will independently assess the quality of included CPGs using the Appraisal of Guidelines Research and Evaluation (AGREE) II tool, which has six domains: scope and purpose, stakeholder involvement, rigour of development, clarity and

Table 1 Preliminary list of organisations publishing recommendations on paediatric injury care

1. Pediatric Emergency Care Applied Research Network	1. Eastern Association for the Surgery of Trauma
2. Pediatric Emergency Research Canada	2. European Society of Anesthesiology
3. Agency for Healthcare Research and Quality	3. International Association for Trauma Surgery and Intensive Care
4. Accreditation Canada	4. International guidelines for skeletal survey imaging
5. American Academy of Orthopedic Surgeons	5. International Trauma Anesthesia and Critical Care Society
6. American Academy of Pediatrics	6. National Association for Healthcare Quality
7. American Association for the Surgery of Trauma	7. National Emergency Medical Services
8. American Association of Neurological Surgeons/Congress of Neurological Surgeons	8. National Guidelines Clearinghouse
9. American Board of Orthopedic Surgery	9. National Institute of Health and Care Excellence
10. American College of radiology	10. National Quality Forum
11. American College of Surgeons	11. Orthopedic Trauma Association
12. American College of Emergency Physicians	12. Pediatric Critical Care Transfusion and Anemia Expertise Initiative
13. American Heart Association pediatric guidelines	13. Pediatric Health Information System database
14. American Pediatric Surgical Association	14. Pediatric Orthopaedic Society of North America
15. American Trauma Society	15. Pediatric Trauma Society
16. Australasian Trauma Society	16. Royal college of Radiologists (paediatric trauma protocols)
17. Australasian Association for Quality in Healthcare	17. Royal College of Paediatrics and Child Health
18. Brain Trauma Foundation	18. Society for Pediatric Radiology (Child Abuse Imaging Committee)
19. British Orthopaedic Association (standards for trauma)	19. Society of Trauma Nurses
20. British Society of Children's Orthopaedic Surgery	20. Scottish Intercollegiate Guidelines Network (SIGN)
21. British Trauma Society	21. Translating Emergency Knowledge for Kids
22. Canadian Institutes for Health Information Canadian Pediatric Society	22. Trauma Association of Canada
23. Canadian Paediatric Society	23. Trauma Audit Research Network
24. Canadian Association of Emergency Physicians	24. Trauma.org
25. Choosing Wisely	25. Western Trauma Association
	26. WHO

presentation, applicability and editorial independence.¹⁷ Each domain with a score $\geq 60\%$ will be considered effectively addressed. CPGs will be considered high quality if they score $\geq 60\%$ in at least three of the six AGREE II domains, including domain 3 (rigour of development). If three domains or more scored $\geq 60\%$ and domain 3 scored $< 60\%$, the CPG will be considered of moderate quality. CPGs scoring $< 60\%$ in two or more domains and scoring $< 50\%$ in domain 3 will be considered of low quality. Two content experts will then use the AGREE Recommendations Excellence (AGREE-REX) instrument to independently assess the clinical applicability and implementability of guideline recommendations.¹⁸ AGREE-REX has nine items covering evidence, clinical applicability, values and preferences and implementability. To ensure feasibility and timeliness of our review, if more than 10 CPGs are identified, we will apply AGREE-REX only to CPGs of moderate or high quality according to AGREE II.

Metasynthesis of recommendations

We will synthesise evidence on recommendations using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) Evidence-to-Decision framework: the quality of CPGs from which recommendations were extracted (AGREE II), levels of evidence for benefits and harms, strength of recommendations,

clinical applicability and implementability (AGREE-REX) and the number of times a recommendation appears in eligible CPGs. We will use these elements to develop a recommendations matrix that will be piloted on a random sample of CPG recommendations. Matrix data will then be extracted independently by pairs of reviewers for each recommendation. We will stratify the synthesis by injury type, that is, traumatic brain injury, spinal cord injury, thoracoabdominal, orthopaedic and multisystem. CPGs from low-income and middle-income countries will be addressed in a separate review.

Discrepancies in all phases of the review will be resolved by initial review by a senior member of the research team (NY) followed by consensus among members of the intersectorial project advisory committee, when necessary.

Limitations of study

For feasibility reasons, our search strategy was not developed to systematically identify CPGs that do not specifically target paediatric injury populations. Thus, we may miss recommendations on paediatric injury care if they are included in CPGs that target general paediatric populations (eg, ED or Intensive Care Unit populations) or trauma populations of all ages if no keywords relating to paediatrics and injury are present in the title or abstract. However, these recommendations are likely to be identified by consulting professional organisation websites

Table 2 Search strategy for PubMed (13 September 2021)

Concepts	PubMed search strategy	Research	No. of results
Guideline (controlled vocabulary)	“Guideline”(Publication Type] OR “Guidelines as Topic”(Mesh)	#1	204 535
Guideline (free text)	Guide*(TIAB] OR guideline(TIAB] OR guidelines(TIAB] OR “practice guideline”(TIAB] OR “practice guidelines”(TIAB]	#2	761 250
Total for guideline	#1 OR #2	#3	866 374
Paediatric (controlled vocabulary)	adolescent(MeSH] OR “Child”(Mesh] OR “Infant”(Mesh] OR “Pediatrics”(Mesh)	#4	3 748 622
Paediatric (free text)	adolescen*(TIAB] OR baby(TIAB] OR babies*(TIAB] OR boy(TIAB] OR boys(TIAB] OR child*(TIAB] OR girl*(TIAB] OR infan*(TIAB] OR kid(TIAB] OR kids(TIAB] OR neonat*(TIAB] OR newborn*(TIAB] OR paediatric*(TIAB] OR pediatric*(TIAB] OR “skeletal immature”(TIAB] OR toddler(TIAB]	#5	2 529 627
Total for paediatric	#4 OR #5	#6	4 467 031
Trauma (controlled vocabulary)	“Brain Hemorrhage, Traumatic”(MeSH] OR “Brain Injuries”(MeSH:NoExp) OR “Coma, Post-Head Injury”(MeSH:NoExp)OR “Cranocerebral Trauma”(MeSH:NoExp)OR “Diffuse Axonal Injury”(MeSH:NoExp)OR “Fractures, Bone”(Mesh] OR “Head Injuries, Closed”(MeSH:NoExp)OR “Head Injuries, Penetrating”(MeSH:NoExp)OR “Intracranial Hemorrhage, Traumatic”(MeSH] OR “Orthopedics/surgery”(Mesh] OR “Skull Fractures”(MeSH] OR “Spinal Cord Injuries”(Mesh] OR “Wounds and Injuries”(Mesh)	#7	946 800
Trauma (free text)	Fractur*(TIAB] OR Injur*(TIAB] OR TBI(TIAB] OR trauma(TIAB)	#8	1 272 601
Total for trauma	#7 OR #8	#9	1 720 079
Overall	#3 AND #6 AND #9	#10	12 522
Exclusion 1	#10 NOT (Editorial(ptyp] OR Letter(ptyp] OR Case Reports(ptyp] OR Comment(ptyp))	#11	11 232
Exclusion 2	Limit to articles since 2007	#12	8358

listed by research team members (table 1). In addition, the injury keywords in the research strategy are exhaustive and our goal is to synthesise recommendations specific to children rather than recommendations for adults applied to children.

ETHICS AND DISSEMINATION

Research ethics approval is not required as it is a secondary analysis of published data. Results of our study will be disseminated in a peer-reviewed journal, international scientific meetings and an accessible synthesis will be distributed to healthcare providers through clinical and healthcare quality associations.

Author affiliations

¹Department of Social and Preventive Medicine, Faculté de médecine, Université Laval, Quebec City, Quebec, Canada

²Population Health and Optimal Health Practices Research Unit, Trauma – Emergency – Critical Care Medicine, Centre de Recherche du CHU de Québec (Hôpital de l’Enfant-Jésus), Université Laval, Québec City, Québec, Canada

³Division of Emergency Medicine, Department of Paediatrics, Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada

⁴Faculty of Nursing, Université Laval, Quebec City, Quebec, Canada

⁵Departments of Critical Care Medicine, Medicine and Community Health Sciences, O’Brien Institute for Public Health, University of Calgary, Calgary, Alberta, Canada

⁶Sainte-Justine Hospital, Department of Paediatric Surgery, Université de Montréal, Montreal, Quebec, Canada

⁷Division of Orthopaedic Surgery, Children’s Hospital of Eastern Ontario, Ottawa, Ontario, Canada

⁸Pediatrics, Emergency Medicine, and Community Health Sciences, Cumming School of Medicine, University of Calgary, Calgary, Alberta, Canada

⁹Division of Emergency Medicine, Hospital for Sick Children, University of Toronto, Toronto, Ontario, Canada

¹⁰Transplant Québec, Montréal, Québec, Canada

¹¹Department of Pediatrics, Division of Emergency Medicine, CHU Sainte-Justine, Université de Montréal, Montreal, Quebec, Canada

¹²Department of Pediatrics, Children’s Hospital of Eastern Ontario, Ottawa, Ontario, Canada

¹³Division of Pediatric Emergency Medicine, McGill University Health Centre, Montreal Children’s Hospital, Montreal, Quebec, Canada

¹⁴Department of Pediatrics, Université Laval, Québec City, Québec, Canada

¹⁵George & Fay Yee Centre for Health Care Innovation, Children’s Hospital Research Institute of Manitoba, Department of Pediatrics and Child Health, University of Manitoba, Winnipeg, Manitoba, Canada

¹⁶Department of Anesthesiology and Critical Care Medicine, Division of Critical Care Medicine, Faculté de médecine, Université Laval, Quebec City, Québec, Canada

¹⁷Department of Pediatrics, BC Injury Research and Prevention Unit, The University of British Columbia, Vancouver, British Columbia, Canada

¹⁸Faculty of Health, York University, Toronto, Ontario, Canada

¹⁹School of Public Health and Preventive Medicine, Monash University, Clayton, Victoria, Australia

²⁰Department of Surgery, University of Calgary, Calgary, Alberta, Canada

Twitter Lynne Moore @Moore, Gabrielle Freire @GabResearchMD, Melanie Berube @BrubMlanie1 and Matthew Weiss @matthewweiss91

Contributors All authors were involved in conceiving and designing the protocol and read, revised and approved the final manuscript. LM and P-AT drafted the manuscript.

Funding This work was supported by Canadian Institutes of Health Research grant number 461381. The funder had no role in developing the protocol.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Melanie Berube <http://orcid.org/0000-0002-6657-3915>

Pier-Alexandre Tardif <http://orcid.org/0000-0003-3003-2399>

Matthew Weiss <http://orcid.org/0000-0002-1052-0128>

Roger Zemek <http://orcid.org/0000-0001-7807-2459>

Alexis F Turgeon <http://orcid.org/0000-0001-5675-8791>

REFERENCES

- 1 Parachute. The cost of injury in Canada: Parachute: Toronto, ON, 2015. Available: http://www.parachutecanada.org/downloads/research/Cost_of_Injury-2015.pdf
- 2 COMMITTEE ON PEDIATRIC EMERGENCY MEDICINE, COUNCIL ON INJURY, VIOLENCE, AND POISON PREVENTION, SECTION ON CRITICAL CARE, SECTION ON ORTHOPAEDICS, SECTION ON SURGERY, SECTION ON TRANSPORT MEDICINE, PEDIATRIC TRAUMA SOCIETY, AND SOCIETY OF TRAUMA NURSES PEDIATRIC COMMITTEEShook JE, Chun TH. Management of pediatric trauma. *Pediatrics* 2016;138:e20161569.
- 3 Lumba-Brown A, Yeates KO, Sarmiento K, et al. Centers for disease control and prevention guideline on the diagnosis and management of mild traumatic brain injury among children. *JAMA Pediatr* 2018;172:e182853.
- 4 Kellie Leitch K. Reaching for the Top: A Report by the Advisor on Healthy Children and Youth [Health Canada], 2007. Available: https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/hl-vs/alt_formats/hpb-dgps/pdf/child-enfant/2007-advisor-conseillere/advisor-conseillere-eng.pdf [Accessed 13 May 2020].
- 5 UNICEF. World report on child injury prevention, 2008. Available: https://www.who.int/violence_injury_prevention/child/injury/world_report/en/ [Accessed 13 May 2020].
- 6 Stelfox HT, Bobranska-Artiuch B, Nathens A, et al. A systematic review of quality indicators for evaluating pediatric trauma care. *Crit Care Med* 2010;38:1187–96.
- 7 Ryan MA. Adherence to clinical practice guidelines. *Otolaryngol Head Neck Surg* 2017;157:548–50.
- 8 Johnston A, Kelly SE, Hsieh S-C, et al. Systematic reviews of clinical practice guidelines: a methodological guide. *J Clin Epidemiol* 2019;108:64–76.
- 9 Higgins J, Thomas J, Chandler J. *Cochrane Handbook for systematic reviews of interventions version 6.2 (updated February 2021)*. Cochrane, 2021.
- 10 Moher D, Shamseer L, Clarke M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev* 2015;4:1.
- 11 Institute of Medicine Committee on Standards for Developing Trustworthy Clinical Practice G. *Clinical practice guidelines we can trust*. Washington (DC): National Academies Press (US), 2011.
- 12 McGowan J, Sampson M, Salzwedel DM, et al. PRESS Peer Review of Electronic Search Strategies: 2015 Guideline Statement. *J Clin Epidemiol* 2016;75:40–6.
- 13 Babl FE, Tavender E, Ballard DW, et al. Australian and New Zealand guideline for mild to moderate head injuries in children. *Emerg Med Australas* 2021;33:214–31.
- 14 Kochanek PM, Tasker RC, Carney N, et al. Guidelines for the management of pediatric severe traumatic brain injury, third edition: update of the brain trauma Foundation guidelines. *Pediatr Crit Care Med* 2019;20:S1–82.
- 15 Da Dalt L, Parri Niccolo', Amigoni A, et al. Italian guidelines on the assessment and management of pediatric head injury in the emergency department. *Ital J Pediatr* 2018;44:7.
- 16 Chung S, Mikrogianakis A, Wales PW, et al. Trauma association of Canada pediatric Subcommittee national pediatric cervical spine evaluation pathway: consensus guidelines. *J Trauma* 2011;70:873–84.
- 17 Brouwers MC, Kho ME, Browman GP, et al. Agree II: advancing Guideline development, reporting and evaluation in health care. *CMAJ* 2010;182:E839–42.
- 18 Brouwers MC, Spithoff K, Kerkvliet K, et al. Development and validation of a tool to assess the quality of clinical practice guideline recommendations. *JAMA Netw Open* 2020;3:e205535.