

CADTH Reference List

# Hypertonic Saline for the Treatment of Diabetic Ketoacidosis in Children

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## Key Messages

- One non-randomized study was identified regarding the clinical effectiveness of hypertonic saline for the treatment of diabetic ketoacidosis in children.
- One evidence-based guideline was identified regarding the treatment of diabetic ketoacidosis in children.

## Research Questions

1. What is the clinical effectiveness of hypertonic saline for the treatment of diabetic ketoacidosis in children?
2. What are the evidence-based guidelines regarding the treatment of diabetic ketoacidosis in children?

## Methods

### Literature Search Methods

A limited literature search was conducted by an information specialist on key resources including MEDLINE, the Cochrane Library, the University of York Centre for Reviews and Dissemination (CRD) databases, websites of Canadian and major international health technology agencies, as well as a focused internet search. The search strategy comprised both controlled vocabulary, such as the National Library of Medicine's MeSH (Medical Subject Headings), and keywords. The main search concepts were diabetic ketoacidosis and hypertonic saline. For question 1 no filters were applied to limit the retrieval by study type. For question 2 search filters were applied to limit retrieval to guidelines. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2011 and January 21, 2021.

### Selection Criteria

One reviewer screened literature search results (titles and abstracts) and selected publications according to the inclusion criteria presented in Table 1. Full texts of study publications were not reviewed. Open access full-text versions of evidence-based guidelines were reviewed when abstracts were not available.

## Results

One non-randomized study<sup>1</sup> was identified regarding the clinical effectiveness of hypertonic saline for the treatment of diabetic ketoacidosis in children. One evidence-based guideline<sup>2</sup> was identified regarding the treatment of diabetic ketoacidosis in children. No relevant health technology assessments, systematic reviews, or randomized controlled trials were identified.

**Table 1: Selection Criteria**

Criteria	Description
Population	Children (< 18 years of age) experiencing diabetic ketoacidosis
Intervention	Q1: 3% hypertonic saline; or 3% hypertonic saline in combination with mannitol Q2: 3% hypertonic saline or Mannitol
Comparator	Q1: Mannitol Q2: Not applicable
Outcomes	Q1: Clinical benefits and harms Q2: Recommendations regarding best practices
Study designs	Health technology assessments, systematic reviews, randomized controlled trials, non-randomized studies, evidence-based guidelines

Additional references of potential interest that did not meet the inclusion criteria are provided in Appendix 1.

## References

### Health Technology Assessments

No literature identified.

### Systematic Reviews and Meta-Analyses

No literature identified.

### Randomized Controlled Trials

No literature identified.

### Non-Randomized Studies

- Decourcey DD, Steil GM, Wypij D, Agus MSD. Increasing use of hypertonic saline over mannitol in the treatment of symptomatic cerebral edema in pediatric diabetic ketoacidosis: an 11-year retrospective analysis of mortality\*. *Pediatr Crit Care Med*. 2013 Sep;14(7):694-700. [Medline](#)

### Guidelines and Recommendations

- National Institute for Health and Care Excellence. Diabetes (type 1 and type 2) in children and young people: diagnosis and management (*NICE guideline NG18*). 2015. <https://www.nice.org.uk/guidance/ng18/resources/diabetes-type-1-and-type-2-in-children-and-young-people-diagnosis-and-management-pdf-1837278149317>. Accessed 2021 Jan 27.  
See: Recommendation 1.4.57, page 43

## Appendix 1: References of Potential Interest

### Clinical Practice Guidelines – Methodology Unclear

3. Diabetic Ketoacidosis (DKA) treatment. Clinical pathway. Aurora (CO): Children's Hospital of Colorado; 2021: <https://www.childrenscolorado.org/48d62c/globalassets/healthcare-professionals/clinical-pathways/diabetic-ketoacidosis.pdf>. Accessed 2021 Jan 27.  
See: "If cerebral edema is suspected, consider the following," page 3
  4. Endocrinology & Diabetes Unit. Diabetic ketoacidosis protocol toolkit. Vancouver (BC): British Columbia Children's Hospital; 2020: <http://www.bcchildrens.ca/endocrinology-diabetes-site/documents/dk toolkit.pdf>. Accessed 2021 Jan 27.  
See: Section 13, page 2
  5. BSPED interim guideline for the management of children and young people under the age of 18 years with diabetic ketoacidosis. Bristol (GB): British Society for Paediatric Endocrinology and Diabetes; 2020: <https://www.bsped.org.uk/media/1798/bsped-dka-guideline-2020.pdf>. Accessed 2021 Jan 27.  
See: H. Cerebral Oedema, page 9
  6. Perth Children's Hospital. Diabetic ketoacidosis. 2020. <https://pch.health.wa.gov.au/For-health-professionals/Emergency-Department-Guidelines/Diabetic-ketoacidosis>. Accessed 2021 Jan 27.  
See: 3. Cerebral Oedema, Treatment
  7. South Australian paediatric clinical practice guidelines. Diabetic Ketoacidosis (DKA) in children. Adelaide (AU): SA Health; [https://www.sahealth.sa.gov.au/wps/wcm/connect/04ac0b8040d0430e975ebf40b897efc8/Diabetic+Ketoacidosis+%28DKA%29+in+Children\\_Paed\\_v2\\_0.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-04ac0b8040d0430e975ebf40b897efc8-niR3rrN](https://www.sahealth.sa.gov.au/wps/wcm/connect/04ac0b8040d0430e975ebf40b897efc8/Diabetic+Ketoacidosis+%28DKA%29+in+Children_Paed_v2_0.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-04ac0b8040d0430e975ebf40b897efc8-niR3rrN). Accessed 2021 Jan 27.  
See: Treatment of Cerebral Oedema, page 11
  8. Canadian Pediatric Endocrine Group. CPEG pediatric DKA algorithm: ongoing management. Version 8. 2019. <https://cpeg-gcep.net/sites/default/files/forumfiles/CPEG%20DKA%20Algorithm%20for%20Ongoing%20Management.pdf>. Accessed 2021 Jan 27.  
See: Immediate Management – High Suspicion of Cerebral Injury
  9. Bottom line recommendations: Diabetic Ketoacidosis (DKA). Winnipeg (MB): TREKK; 2019: [https://trekk.ca/system/assets/assets/attachments/402/original/2019-06-18\\_DKA\\_BLR\\_v\\_3.1.pdf?1561062009](https://trekk.ca/system/assets/assets/attachments/402/original/2019-06-18_DKA_BLR_v_3.1.pdf?1561062009). Accessed 2021 Jan 27.  
See: Treat Suspected Cerebral Edema, page 2
  10. Provincial clinical knowledge topic: diabetic ketoacidosis, pediatric – emergency & inpatient. Version 1.0. Edmonton (AB): Alberta Health Services; 2018: <https://extranet.ahsnet.ca/teams/policydocuments/1/klink/et-klink-ckv-diabetic-ketoacidosis-pediatric-emergency-and-inpatient.pdf>. Accessed 2021 Jan 27.  
See: Medications, page 22
  11. Diabetic ketoacidosis clinical practice guideline. Dayton (OH): Dayton Children's Hospital; 2018: <https://www.childrensdayton.org/sites/default/files/FINAL%20Diabetic%20Ketoacidosis%20CPG%202019-01.pdf>. Accessed 2021 Jan 27.  
See: Section 12, page 3
  12. National clinical guideline. Management of paediatric diabetic ketoacidosis. Dublin (IE): Royal College of Physicians of Ireland; 2018: <https://www.hse.ie/eng/about/who/cspd/ncps/paediatrics-neonatology/resources/management-of-paediatric-diabetic-ketoacidosis1.pdf>. Accessed 2021 Jan 27.  
See: 7.12.2 Management, page 10
- Wolfsdorf JI, Allgrove J, Craig ME, et al. ISPAD clinical practice consensus guidelines 2014. Diabetic ketoacidosis and hyperglycemic hyperosmolar state. *Pediatr Diabetes*. 2014 Sep;15 Suppl 20:154-179. [Medline](#)  
See: Treatment of cerebral edema

### Review Articles

13. Castellanos L, Tuffaha M, Koren D, Levitsky LL. Management of diabetic ketoacidosis in children and adolescents with type 1 diabetes mellitus. *Paediatr Drugs*. 2020 Aug;22(4):357-367. [Medline](#)
14. Skitch SA, Valani R. Treatment of pediatric diabetic ketoacidosis in Canada: a review of treatment protocols from Canadian pediatric emergency departments. *CJEM, Can*. 2015 Nov;17(6):656-661. [Medline](#)
15. Koves IH, Pihoker C. Pediatric diabetic ketoacidosis management in the era of standardization. *Expert Rev Endocrinol Metab*. 2012 Jul;7(4):433-443. [Medline](#)