



Pediatric
Critical Care
Learning



PCCL Session: Summary Report and Resources

PCCL session topic: "Sweet, Sour, and Salty"

Date: February 21st, 2025

Learning objectives:

- Identify the potential challenges in DKA (diabetic ketoacidosis) management.
- Discuss the cardiac rhythm effects of electrolyte and acid/base derangements.
- Apply a structured approach to hyperkalemia management.

Case:

- Regional community ER with 24/7 Pediatrician support, 3 pediatric inpatient beds, no ICU support, closest PICU more than 3 hours by road or by air transport, depending on availability
- 14-year-old male brought by EMS. Type 1 diabetes with an element of insulin resistance. At baseline manages his own insulin with Basaglar and short acting insulin during the day. There are concerns with compliance.
 - He was found by his mother with a decreased level of consciousness. He received 250ml saline bolus enroute to the hospital
- Initial assessment demonstrated an obese teen, GCS 10 (eyes open to verbal command, incomprehensible sounds, localizes pain)
 - Vitals: **HR 144**, BP 113/57, **RR 38**, SpO2 100% room air, T 36. Weight 124kg. Acidotic breathing and tachypnoea, but clear to auscultation. Abdomen: no masses or tenderness. Moving all limbs.
 - LABS: CBC: **WCC 44.6**, HB 134, Plt 423, **Neutro 34**, Lymph 5. Chemistry: **Na 127**, **K 6.5**, **Cl 82**, **HCO3 4**, **AG 40**, **Cr 190**, **PO4 3.66**, Ca 1.12, **Lactate 7.8**, **glucose 71.6**. Blood gas: **pH 6.97**, **pCO2 20**, **HCO3 4**, **BE -27**. Urinalysis: **Glucose 56**, **Ketone 3+**. Other: Bili 6, ALT 14, GGT 11, Troponin I 17, **CRP 49**.
- BC Children's Hospital DKA protocol was [initiated](#):
 - 1000ml of normal saline (NS) bolus over about 20-30min, then another 500ml of NS over 20-30min, then changed to 500ml/hour of NS as per protocol
 - Vitals: HR 139, RR35, BP 90/61, SpO2 98%. Patient's perfusion improved, CRT less than 2s, had good urine output. GCS fluctuate 9-11
 - Repeat labs: **Na 127**, **K 7**, **Cl 88**, **Ca 1.09**, **Lactate 6.9**, **Ph 7**, **PCO2 16**, **HCO3 4**, **BE -28**
- While on call, patient had a rhythm change on ECG, wide complex tachycardia 170-180, BP 74/50, weak peripheral pulses.



- With multiple remote consultants supporting, adenosine was given with an improvement in BP. Further advice suggested management of the hyperkalemia, and patient received Calcium Chloride 1g IV over 5 min, Ventolin nebulisation 10mg over 15min, Insulin infusion 50U insulin in 500ml NS started at 100ml/h, then increased to 120ml/h (0.1unit/kg/hr).

Learnings:

Treatment of Diabetic Ketoacidosis

- Discussed the importance of early recognition and reaching out for virtual support as well as local supports (on-call colleagues) when treating a complex/ill DKA.
- This patient was complex with **DKA and likely a component of [hyperosmolar hyperglycemic state \(HHS\)](#)**
 - Hyperglycemic hyperosmolar state (HHS) should be suspected when:
 - Hyperglycemia (greater than 33 mmol/L) extremely high blood glucose levels, a hallmark of HHS.
 - Hyper-osmolality (greater than 330 mOsm/L) elevated serum osmolality, which reflects significant dehydration and concentration of solutes due to hyperglycemia.
 - Little to no ketoacidosis
- Discussed if there is suspected Cerebral injury/Edema
 - Signs: Headache, vomiting, altered mental status, bradycardia.
 - Management: Airway/Breathing/Circulation support. Elevate head of bed. Reduce fluid rate by $\frac{1}{3}$, avoiding hypotension.
 - Discussed the delay in administration/decision making in administering hyperosmolar therapy:
 - Mannitol 20%: 0.5–1 g/kg IV over 15 min or 3% sodium chloride (NaCl): 2.5–5 mL/kg IV over 15 min.



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Treatment of Hyperkalemia

- Reviewed the rationale for correcting the potassium (K) and why it impacted the patient in this circumstance.
- Discussed ECG features of hyperkalemia:
 - Tall/peaked T waves, flattened/absent P waves, prolonged PR interval, widened QRS complex, bradycardia, VT, VF
- Reviewed the ease in which all the documents for treatment of DKA, hyperkalemia and cardiac arrhythmias can all be found in the “[in a hurry](#)” section of the PCC landing page.

Resuscitation Wide Complex Tachycardia

- Reviewed the PALS algorithm for treatment of wide complex tachycardia and discussed it in the context of this patient’s hyperkalemia.
- An unstable wide complex tachycardia should be treated with synchronized cardioversion as a first intervention

Resources:

- DKA [Summary](#)
 - [Order set](#)
 - Nursing [Protocol](#):
- Cardiac Arrhythmias
 - [Wide complex tachycardia](#)
- [Treatment of Hyperkalemia](#)
- [PHSA Virtual Support Pathways](#)

The resources shared throughout this session are for reference purposes only. Please consult your health authority leaders for guidance on adoption and use of these resources within your local context. The advice provided during the PCCL sessions is not intended to replace the clinical judgment of the healthcare providers who are with the patient. While PCCL sessions may suggest recommendations, the final decisions regarding a child's care and treatment should always rest with the healthcare professionals involved in their care at both the referring and receiving centres.

If you need additional in the moment support refer to the Provincial Real Time Virtual Support Pathways: If you need additional in the moment support refer to the Provincial Pediatric Virtual Support Pathways: <https://childhealthbc.ca/pcc/provincial-pediatric-virtual-support-pathways>