UNMH Pediatric Diabetic Ketoacidosis Pathway

DKA Triage Screening Tool	
History	Known or **SUSPECTED** Type I Diabetes Mellitus
PLUS ONE OF	• Abdominal Pain • **Altered Mental Status*** • Extreme Thirst • Fatigue • Frequent Urination • Kussmaul Breathing • **Respiratory Distress*** • Vomiting[1] • Weight Loss

Positive = MD/RN SWARM

Blood Glucose > 200 AND SWARM concerning for DKA

Altered Mental Status? Seizure? Shock?

See critical care strategies on last page

YES

TRIAGE B

Bicarbonate or Insulin Bolus [1,4] (including SQ)

10-20 mL/kg NS Bolus (over 1 hr[6])
iStat Chemistry, iStat gas

Lantus SQ OK[5]

Note*: Ketones in urine is needed for diagnosis, but treatment may start before confirmation at physician discretion.

pH < 7.3 or CO_2 < 15 **AND** Ketones in urine*

NO → **Exit Guideline** Diabetic NOT in DKA **vs** Alternate Diagnosis[6]

YES

Repeat POC glucose after bolus

DKA TREATMENT GOALS:

Rapid diagnosis of DKA
Insulin Drip for DKA
Hourly glucose checks on insulin drip
Use 3-bag system
Do not drop glucose > 100 per hour
Appropriate disposition
No bicarbonate treatment

PICU Criteria	
pH < 7.1	Altered Mental Status
K^+ < 2.5	Dysrhythmia
Age < 2 years	Intubation
Profound shock	Cerebral Edema

Floor patients must have a bed on PSCU/6-East!

PHYSICIANS

USE DKA POWERPLAN
Order insulin drip, labs, and TWO bags of IV fluids! (details next page)

See additional treatment (next page)

If pt glucose drops > 100 in one hour, ↑ proportion of IV fluids with dextrose![1,6]

Admit Patient (see PICU Criteria on left)
Insulin pump = Stop pump, call peds endo!

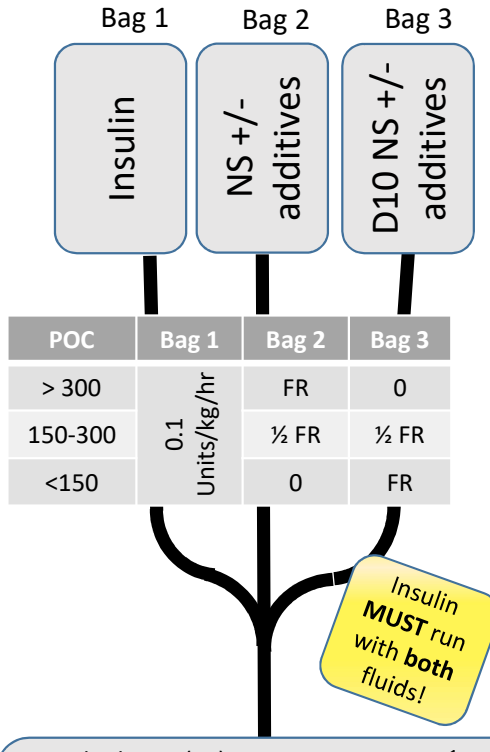
NURSES

Use 3-bag system (on right)
Finish bolus before starting insulin

Hourly POC blood sugars
Q15 min Neuro checks for first hour
Notify MD if glucose drops > 100/hr

Insulin DOES NOT RUN WITHOUT other fluids!

3-Bag System and Starting Rates



POC	Bag 1	Bag 2	Bag 3
> 300	0.1 Units/kg/hr	FR	0
150-300		½ FR	½ FR
<150		0	FR

Fluid Rate (FR) = 1.5 x maintenance[1]

Do NOT slow insulin rate!

If pt glucose drops > 100 in one hour, ↑ proportion of fluids running with dextrose![1,6]

H&P AND TREATMENT INFORMATION

HISTORY AND PHYSICAL	
Review of Systems	Polyphagia, Polydypsia, Polyuria, Weight Loss, Anorexia, Vomiting, Fatigue, Malaise
Known Diabetic	Insulin Use, most recent dose, insulin pump Home glucose/ketone measurements Age at dx, prior hospitalizations, previous DKA
Other Teenage females	Infectious sx, Ingestions, Trauma Risk of Pregnancy, STI
Physical Exam	Airway Breathing: Tachypnea, Kussmaul breathing Circulation: Capillary refill, pulses Neuro: Pupils, CN exam, motor, GCS, Mental Status Vital Signs (including temperature)

ADDITIONAL TREATMENT

Assure good IV access but avoid central lines due to risk of thrombus

Neurologic assessments every 15 minutes for first hour or until stable

Reeval for need for 2nd bolus
Start 1.5 MIVF NS until 3-bag system ready

Start insulin infusion at least 1 hour AFTER 1st bolus started[1,4,6]

Add glucose to fluids when blood sugar drops below 300 mg/dL or if dropping > 100/hr

0.2 U/kg Lantus now if new diabetic. Otherwise order their regular home dose.

Do NOT give bicarbonate OR insulin boluses[1,4]

Add antibiotic coverage if febrile

ORDER INFORMATION

LAB ORDERS	
All	If New Diabetic
VBG Chem 7, Mg, Phos CBC with diff Hemoglobin-A1c Ionized Calcium (iCa) Urinalysis (UA) Q1 hour POC Glucose	Islet Cell Antibodies Insulin antibodies TSH FT_4 Celiac Disease Reflex Panel
If Severe DKA add a Lactate	

IV FLUID ORDERS[1]

ALWAYS ORDER a bag with AND a bag without dextrose!

	K > 5.5	K < 5.5
< 35 kg	Normal Saline *AND* D10 NS	NS + 20 mEq/L KCl + 20 mEq/L KPhos *AND* D10 + NS + 20 mEq/L KCl + 20 mEq/L KPhos
> 35 kg	Normal Saline *AND* D10 NS	NS + **40** mEq/L KCl + 20 mEq/L KPhos *AND* D10 + NS + **40** mEq/L KCl + 20 mEq/L KPhos

IF K < 2.5 or > 5.5 order an EKG
K Acetate instead of KCl is allowed

USE THE FOLLOWING INITIAL RATE

POC Glucose	NS +/- additives	D10 NS +/- additives
> 300	1.5 maintenance	Bag at bedside
150 - 300	0.75 maintenance	0.75 maintenance
< 150	Bag at bedside	1.5 maintenance

Nurses need BOTH bags to start insulin drip
Specialized fluids take time, start with NS at 1.5 maintenance while waiting for insulin and supplemental fluids

CRITICAL CARE STRATEGIES		
CEREBRAL EDEMA RISK FACTORS[3]		
Risk Factors	Age < 3 years Prior Hx of DKA pH < 7.0 Na fails to correct as sugar ↓ Initial glucose > 1000 mg/dL	Bolus Insulin administration Insulin infusion within 1 hours of 1st fluid bolus Bicarbonate administration
CEREBRAL EDEMA DIAGNOSIS[3] = 1 Major + 2 Minor or 1 Diagnostic + 2 Major		
Diagnostic	Abnl verbal/motor to pain Posturing (e.g. decorticate)	CN Palsy (usually III, IV, or VI) Cheyne-Stokes respirations
Major	Altered/fluctuating consciousness (GCS ≤ 13)	Sustained bradycardia Age-inappropriate incontinence
Minor	Vomiting Headache Age < 5 years	Does not easily wake Diastolic bp > 90 mmHg
Cerebral Edema Treatment:		
Elevate head of bed 3% NS over 30 minutes Mannitol Consider a slower initial insulin drip rate[4] Consider head CT AFTER initial treatment		5 mL/kg 0.5g/kg 0.05 units/kg/hr
Call PICU attending if intubation or treatment for cerebral edema is required		
Shock Treatment:		
NS or LR boluses until perfusion restored		20 mL/kg (up to 3)
Dopamine (Cold shock) Epinephrine (Cold shock) Norepinephrine (Warm shock)		3 mcg/kg/min (Max 20) 0.03 mcg/kg/min (Max 1) 0.03 mc/kg/min (Max 1)
Fever		See UNMH PED Sepsis Pathway
Possible alternate diagnoses:		
Stress response due to bacteremia, pneumonia, sepsis, metabolic disorder, or trauma		

Diabetic Ketoacidosis Criteria[6]		
Mild	Moderate	Severe
pH 7.21 – 7.3 OR CO_2 11-15	pH 7.11 – 7.2 OR CO_2 6-10	pH < 7.1 OR CO_2 < 5 OR Altered Mental Status

References:

1. Cooke DW, Plotnick L. Management of Diabetic Ketoacidosis in Children. Pediatrics in Review. Dec 2008,29(12)415-416.

2. Muir AB, Quisling RG, Yand MCK, Rosenbloom AL. Cerebral Edema in Childhood Diabetic Ketoacidosis Natural history, radiographic findings, and early identification. Diabetes Care 2004 Jul: 27(7): 1541-1546.

3. Palladino A, Srinivasa V, Lord K, Jacobstein C, Gaines S, Lavelle J. November 2015. *ED Pathway for the Evaluation/Treatment of the Child With Suspected DKA*. https://www.chop.edu/clinical-pathway/diabetes-type1-with-dka-clinical-pathway. Accessed September 20, 2018.

4. Wolfsdorf JI. The International Society of Pediatric and Adolescent Diabetes guidelines for management of diabetic ketoacidosis: do the guidelines need to be modified? Pediatric Diabetes 2014: 15: 277-286.

5. Harrison VS, Rustico S, Palladino AA, Ferrara Christine, Hawkes CP. Glargine co-administration with intravenous insulin in pediatric diabetic ketoacidosis is safe and facilitates transition to a subcutaneous regimen. Pediatric Diabetes. 2017 Dec: 18(8): 742-748.

6. Wolfsdorf JI, Glaser N, Angus M, Fritsch M, Hanas R, Rewers A, Sperling MA, Codner E. ISPAD Clinical Practice Consensus Guidelines 2018: Diabetic ketoacidosis and the hyperglycemia hyperosmolar state. ISPAD Clinical Practice Consensus Guidelines. 11 April 2018.