Title: Adult Diabetic Ketoacidosis (DKA) Management	
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SCOPE:
Adult Critical Care, Emergency Department

RELATED POLICIES/PROCEDURES:
   A. **PCD #14.009 Treatment of Adult Patients with Low Blood Sugar**
   B. **DKA Insulin Calculators—EMMC intranet homepage**

DEFINITIONS: None

PURPOSE: To treat patients with DKA in standardized evidence based approach with the goal to decrease time to anion gap closure and ketone clearance.

POLICY:
   A. **This protocol is for use only in a critical care setting.**
   B. **Patients with DKA powerplan orders will be managed with an insulin drip, at minimum, until the anion gap is closed (less than 13 mmol/L).**

PROCEDURE:
   A. **The DKA Critical Care Adult powerplan is initiated by the physician/AHP.**
   B. **Ensure patient has 2 large bore IVs or central access.**
   C. **Blood glucose level will be measured using i-STAT until glucose is less than 500 mg/dL AND anion gap is less than 13mmol/L.**
   D. **Administer IV fluid bolus and maintenance as ordered.**

E. Access the DKA calculator on the EMMC homepage and enter required information on the DKA START DOSES tab.
F. At the DKA START DOSES tab, please enter the most current/recent potassium level and follow the prompts on replacement if needed.If the patient is currently on a Regular Insulin Infusion,

G. Administer Regular insulin as ordered and start the IV insulin infusion per the DKA START DOSES tab on the calculator. Do not administer insulin (infusion or bolus dose) unless potassium is greater than 3.2 or actively being replaced.
H. Monitor blood glucose hourly or as instructed by the calculator.
I. Utilizing the DKA INFUSION CALCULATOR tab, administer insulin bolus doses; adjust the insulin infusion and adjust the Dextrose 5% with 0.45% NaCl infusion. Repeat glucose at instructed interval until anion gap is less than 13mmol/L.
J. When the glucose by i-STAT is less than 500 AND anion gap is less than 13 perform bedside glucose monitoring using glucose meter every hour or as directed by DKA calculator.
K. Once anion gap is less than 13mmol/L use "protocol" communication type to order the following:
   a. Modify diet order to a diabetes diet, 1800 kcal.
   b. Discontinue the maintenance fluids subphase.
   c. Discontinue DKA lab subphase.
   d. Discontinue the Regular Insulin IVP PRN order.
   e. Maintain Dextrose 5% with 0.45 % NaCl IV at 100mL/hr until patient eating; then discontinue.
   f. Initiate & select Long Acting Insulin (Detemir/Levemir) doses based on time of gap closure.
   g. Transition to adult critical care insulin drip protocol, weaning insulin drip to off as able.
   h. Discuss conversion to home insulin therapy with rounding Physician.
L. Treatment of hypoglycemia will be managed per PCD 14.009, Treatment of Adult Patients with Low Blood Glucose.
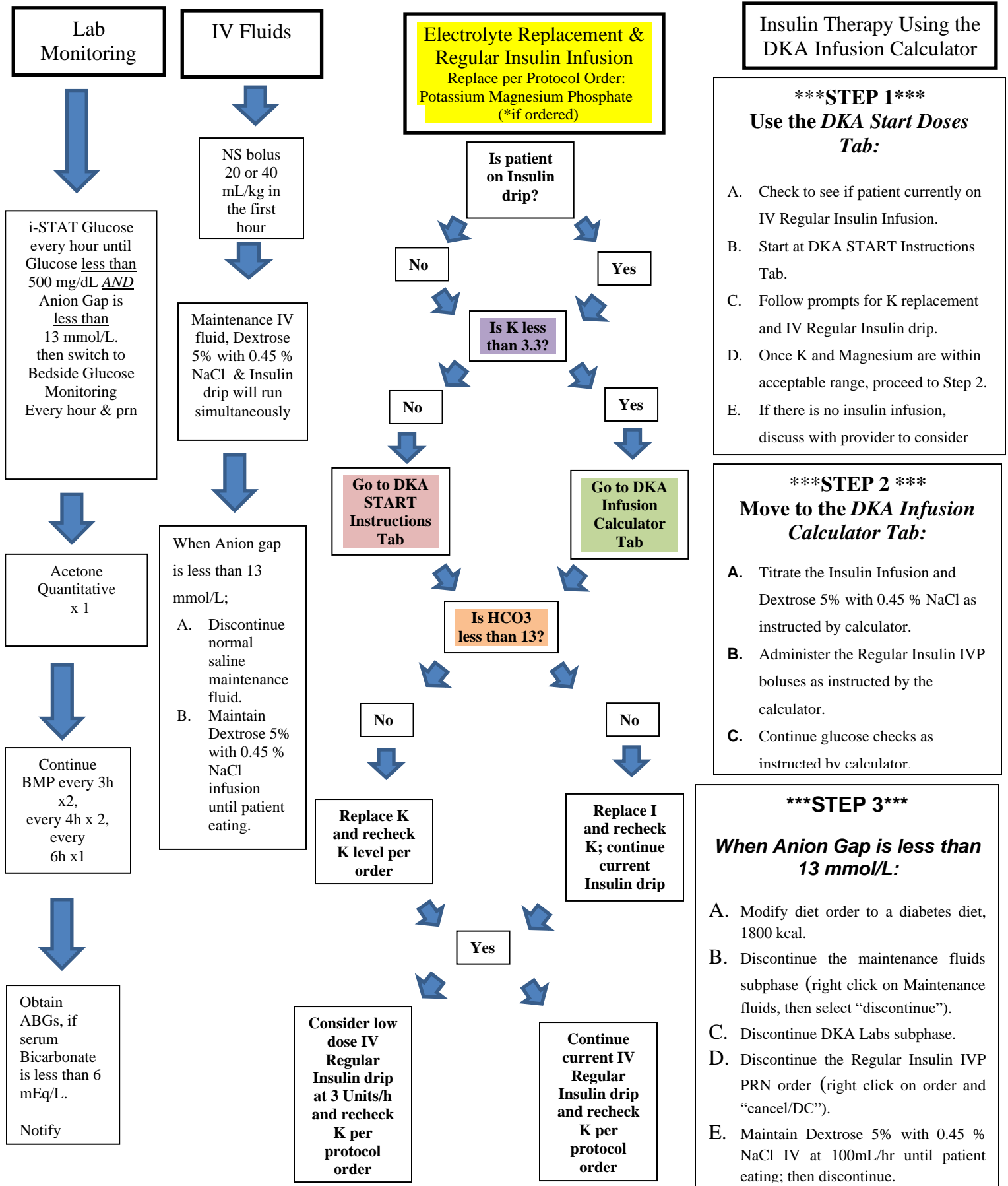

REFERENCES: None

ATTACHMENTS:
Attachment 1-Adult Critical Care DKA Algorithm
Attachment 2- Network Downtime
Attachment 3- DKA Worksheet

DKA Attachment 1-Adult Critical Care DKA Algorithm
DKA powerplan initiated by provider order
To be used with the DKA Insulin Calculator on the EMMC Intranet site

Lab Monitoring

i-STAT Glucose every hour until Glucose less than 500 mg/dL AND Anion Gap is less than 13 mmol/L. then switch to Bedside Glucose Monitoring Every hour & prn

Acetone Quantitative x 1

Continue BMP every 3h x2, every 4h x 2, every 6h x1

Obtain ABGs, if serum Bicarbonate is less than 6 mEq/L.

Notify

IV Fluids

NS bolus 20 or 40 mL/kg in the first hour

Maintenance IV fluid, Dextrose 5% with 0.45 % NaCl & Insulin drip will run simultaneously

When Anion gap is less than 13 mmol/L;
A. Discontinue normal saline maintenance fluid.
B. Maintain Dextrose 5% with 0.45 % NaCl infusion until patient eating.

Electrolyte Replacement & Regular Insulin Infusion
Replace per Protocol Order:
Potassium Magnesium Phosphate
(*if ordered)

Is patient on Insulin drip?

No → **Is K less than 3.3?**

Yes → **Is K less than 3.3?**

No → **Go to DKA START Instructions Tab**

Yes → **Go to DKA Infusion Calculator Tab**

Is HCO3 less than 13?

No → **Replace K and recheck K level per order**

No → **Replace I and recheck K; continue current Insulin drip**

Yes →

Consider low dose IV Regular Insulin drip at 3 Units/h and recheck K per protocol order

Continue current IV Regular Insulin drip and recheck K per protocol order

Insulin Therapy Using the DKA Infusion Calculator

STEP 1
Use the *DKA Start Doses Tab:*

A. Check to see if patient currently on IV Regular Insulin Infusion.
B. Start at DKA START Instructions Tab.
C. Follow prompts for K replacement and IV Regular Insulin drip.
D. Once K and Magnesium are within acceptable range, proceed to Step 2.
E. If there is no insulin infusion, discuss with provider to consider

***STEP 2 ***
Move to the *DKA Infusion Calculator Tab:*

A. Titrate the Insulin Infusion and Dextrose 5% with 0.45 % NaCl as instructed by calculator.
B. Administer the Regular Insulin IVP boluses as instructed by the calculator.
C. Continue glucose checks as instructed by calculator.

STEP 3

When Anion Gap is less than 13 mmol/L:

A. Modify diet order to a diabetes diet, 1800 kcal.
B. Discontinue the maintenance fluids subphase (right click on Maintenance fluids, then select "discontinue").
C. Discontinue DKA Labs subphase.
D. Discontinue the Regular Insulin IVP PRN order (right click on order and "cancel/DC").
E. Maintain Dextrose 5% with 0.45 % NaCl IV at 100mL/hr until patient eating; then discontinue.

DKA- Attachment 2

Network Downtime

A. If a network downtime occurs and the DKA Calculator is not available, the following infusion titration will be used:

:

Glucose Result	Current Insulin Infusion Rate (units/hour)			D5 ½NS IV Rate
	1 – 5	6 – 10	11 – 16	
Less than 65 mg/dL	Stop Insulin Infusion. Give 25 mL D50 IV. Check glucose in 30 minutes.			250 mL/hr
66 – 90	Decrease Insulin Infusion rate by 50%. Check glucose in 1 hour.			225
91 – 140	No Change	Decrease by 2 units/hour if glucose is falling.		200
141 – 200	Increase infusion1 by unit/hr		No Change	175
201 – 250	increase infusion by 1 unit/hour	2 units IV bolus and increase infusion by 2 units/hour	4 units IV bolus and increase 3 units/hour	150
251 – 300	6 units IV bolus and increase 1 unit/hour	8 units IV bolus and increase 2 units/hour	8 units IV bolus and increase 3 units/hour	100
301 – 350	8 units IV bolus and increase 1 unit/hour	10 units IV bolus and increase 3 units/hour	10 units IV bolus and increase 4 units/hour	50
351 – 400	10 units IV bolus and increase 2 units/hour	12 units IV bolus and increase 4 units/hour	12 units IV bolus and increase 6 units/hour	OFF
Greater than 400	Notify provider			

Initiate IV- NS Maintenance as ordered(Standard or Reduced Volume)

Standard

- □ Sodium Chloride 0.9%- 40mL/kg Bolus over 1 hour
- □ Sodium Chloride 0.9%- 500mL/hr x 4 hours
- □ Change to Sodium Chloride 0.45% at 150mL/hr thereafter

or

Reduced Volume

- □ Sodium Chloride 0.9%- 20mL/kg Bolus over 1 hour
- □ Sodium Chloride 0.9%- 250mL/hr x 2 hours
- □ Sodium Chloride 0.9%- 125mL/hr x 8 hours
- □ Call Provider to obtain further IV fluid orders

Ensure lab work is done as ordered

Glucose by i-STAT every one hour unless otherwise instructed by DKA tab

Acetone once □ _____

BMP every 3 hours x 2 □□, every 4 hours x 2 □□, every 6 hours x 1□

- • If serum bicarb less than 6, order ABG and notify the provider.
- • Check glucose with I-Stat until Glucose less than 500 **AND** Anion Gap less than 13, then perform bedside glucose with glucose meter every 1 hour and prn

Replace Electrolytes per protocols.

Do not administer insulin (infusion or bolus dose) unless potassium is greater than 3.2 or actively being replaced.

Please discuss with provider if patient on current insulin infusion and potassium is less than 3.2.

DKA Insulin Calculator-Start Doses Tab

- □ Give Regular Insulin bolus as instructed
- □ Start Insulin drip as instructed
- □ Check glucose in 1 hour

DKA Infusion Calculator Tab -Use this tab every hour unless instructed otherwise

Enter last Anion Gap
Enter hourly glucose result
Enter Insulin infusion Rate
Follow instructions for:

- □ Regular insulin bolus dose
- □ Insulin infusion rate
- □ Dextrose 5% with 0.45% NaCl IV rate

DKA Infusion Calculator Tab When Anion Gap is less than 13

Using "protocol" as communication type –RN will enter the following orders

□ A. Modify diet order to a diabetes diet, 1800 kcal

□ B. Discontinue the maintenance fluids subphase

□ C. Discontinue DKA lab subphase

□ D. Discontinue the Regular Insulin IVP PRN order

□ E. Maintain Dextrose 5% with 0.45% NaCl IV at 100mL/hr until patient eating; then DC.

□ F. Initiate & select Long Acting Insulin (Levemir) doses, based on time of day.

□ G. Discontinue DKA Insulin Regular 100 units/100mL

□ H. Order Adult Critical Care IV Insulin protocol, weaning IV insulin to off as able.

□ I. Discuss conversion to home insulin therapy with rounding Physician.