ADVOCATE CHRIST MEDICAL CENTER
DKA (DIABETIC KETOACIDOSIS) TREATMENT GUIDELINES

DEFINITION
-Glucose >250 mg/dL, pH <7.3, HCO3 <15, + ketones

HISTORY
-Insulin dose and times
-Intercurrent illness
-Non-compliance

PHYSICAL
-Vital signs including temperature
-Infection sources
-Degree of dehydration
-usually it is 10% in DKA
-estimate: 5% mild dryness of mucous membranes, mild oliguria
7% moderate dry mucous membranes, moderate oliguria
10% dry mm, anuria, shock (decreased mental status, poor capillary refill, tachycardia, and hypotension)
-if prior, recent, "pre-morbid" weight is known may calculate deficit using Kg:
(pre- morbid wt)- (today's wt) = deficit
then 1 Kg=1000 mg=1000 cc
-if no pre-morbid wt available can solve for this "x" based on clinical estimate of % dehydration
(x)-(x) (% dehydration) = today's wt
-Maintenance fluids (Over 24 hours)
100 ml/Kg for each Kg up to 10 Kg, plus
50 ml/Kg for each Kg between 10-20 Kg, plus
20 ml/Kg for each Kg>20 Kg

LABORATORY STUDIES
-Chemstrip immediately with plasma glucose to lab
-ABG (venous blood gas acceptable)
-Basal Metabolic Profile, Ca, PO4 Mg
-CBC, U/A
-Serum Acetone
-Serum Osmolarity
-Hemoglobin A1c (lavender top)
-For new diabetics (<45 y.o.):
GAD 65 (Glutamic Acid Decarboxylase)
ICA 512 (Islet Cell Antibodies)
C-peptide

MONITOR (use flow sheet)
-Consider EMLA cream for analgesia and/or a large bore (central or peripheral) line to draw specimens

-Glucose by fingerstick	Q1 hr
-K+, pH (venous)	Q1 hr
-Vital signs	Q1 hr
-Input (IVF, oral intake)	Q1 hr
-Output	Q1 hr/q void
-Lytes, BUN, Cr	Q2 hr
- Ca++, PO4, Mg++	Q4 hr

FLUIDS
-Avoid overhydration i.e. <4 L/M^2/24 hr or ~2x maintenance, to prevent cerebral edema
-Fluid bolus *only* if signs of shock
    -Use 0.9% NaCl 20 ml/Kg over ½ -1 hour
    -Repeat if still shocky
-After bolus
    -Initially with 0.9%NaCl x 2 hours
    -Then use 0.45% NaCl +/- lytes +/- dextrose (see below)
-Rate: different values have been advocated
(a) 1.5 x maintenance
(b) maintenance + ½ deficit replacement over 8 hours and next ½ deficit over next 16 hours
    include bolus as part of deficit replacement
    do not replace urine output, unless output >4 ml/Kg/hr after 4 hours of fluids

LYTES
<u>Potassium and Phosphate</u>
-Add 40 mEq K/L after first void and if K+ < 6.0
-Give as KCl or ½ KCL + ½ KPO_4 if PO_4 <2 mEq/l
-Must check Ca^{++} in 4 hours
-Usually only give supplemental PO_4 x 8 hour
<u>Sodium</u>
-Usually Na+ is low, and if it does not rise with Rx, it may indicate too much free water was given (which may contribute to cerebral edema) and 0.9% NaCl should be continued (vs 0.45% NaCl)
<u>Bicarbonate</u>
If pH<7.0 and Bicarbonate <5, give 2 Amps of NaHCO3 (88 mEq) in 500 ml of 0.45% NaCl in 4 hours

INSULIN/GLUCOSE
Use separate IV line from IV fluids
FOR ADULTS: Bolus 0.1 Unit/Kg (Optional)
ADULT DRIP CONCENTRATION: Regular insulin, 1 Unit/ml of 0.9 % NaCl
FOR CHILDREN (<18 yo): NO BOLUS
CHILD DRIP CONCENTRATION: Regular Insulin, 1 Units/10 ml 0.9% NaCl

Glucose target is 200-250 mg/dL

Glucose should decrease by 50-75 mg/dL/hour

START DOSE INSULIN DRIP

Glucose mg/dL	Insulin Drip Units/Hour
>500	0.1 Unit/Kg/Hour or 15 units/hour, whichever is **greater**
451-500	12
401-450	10
351-400	8
301-350	6
>300	5

TITRATION DOSE INSULIN DRIP

Glucose mg/dL	**HCO3 mEq/L**	**INSULIN** Regular Human Insulin (Units/Hour)	**IVF**
>500	<19	Increase drip by 4 Units/hour	0.9% NaCl
251-500	<19	Do not adjust rate if the Glucose is decreasing by 50-75 mg/dL/hr If the Glucose is NOT decreasing by 50-75 mg/dL/hr then increase the drip rate by 2 Units/hr	0.9% NaCl
151-250	<19	Keep insulin drip at same rate	**CHANGE TO** D5%/0.45% NaCl
101-150	<19	Keep insulin drip at same rate	**CHANGE TO** D10%/0.45% NaCl
101-150	<19	Decrease Insulin Drip by 50% (0.05 Unit/Kg/Hr)	D10%/0.45% NaCl
71-100	<19	Hold insulin drip for 1 hour	D10%/0.45% NaCl
<70	<19	Give ½ Amp of D50% and recheck in 5 minutes	D10%/0.45% NaCl
>101	**<19**	Resume insulin drip at 0.05 Unit/Kg/Hour and follow titration as above	**D10% /0.45% NaCl**
200-250	**>19**	Give Novolog 0.05 Units/Kg subcutaneously And Discontinue Insulin Drip 1 hour later	**D/C** D10%/0.45% NaCl

TRANSITION FROM INSULIN DRIP TO SUBCUTANEOUS REGIMEN

CHILDREN:

Please refer to Pediatric Endocrinologist instructions

ADULTS

If the patient is in the Emergency Department and on the insulin drip for >12 hours, add **LANTUS**, 0.3 Units/Kg Subcutaneously q 24hours, either at 9 am or 10 pm (whichever is closer) and continue the insulin drip according to protocol.

Check glucose by finger-stick:

-Every 4 hours if patient not eating regular meals

-Before each meal and at bedtime (7 am, 12 pm, 5 pm, 10 pm) if patient able to eat meals

Use Novolog sliding scale:

Glucose(mg/dL)	Novolog Dose (units)
151-200	**3**
201-250	**4**
251-300	**6**
301-350	**8**
351-400	**10**

CEREBRAL EDEMA

-Usually occurs when biochemical abnormalities are improving

-Possible causes: too rapid a drop in glucose, excess fluids, failure of sodium to rise, bicarb. Rx

-Occurs more commonly in infants/younger children and in new-onset DM type 1

-Signs of Increased ICP: headache, mental status changes, ↑ BP, ↓ P, dilated pupils

-Rx: intubation, hyperventilation, mannitol 1 gm/Kg IV bolus, fluid restriction