

# CASE REPORT

R1吳冠蓉/F 徐英洲  
103.03.01

## Case 1-Basic data

- Gender: 58-yo male
- Date: DAY1 20:12
- C/C: 腹瀉, 吐, 全身無力
- TPR: 36.1/79/16 BP:113/48  
SpO<sub>2</sub>: 87% GCS: E4V5M6
- Triage: 1

## Present illness

- General weakness for about 2 days
- 最近兩天吐拉各several times
- No abdominal pain
- Fever: 沒量體溫
- 自覺食慾差, 沒吃血糖藥, 因為之前有低血糖Hx
- 晚上喘 ↑ →故來our ER

## History

- Medical history:
  - Old TB → COPD(?)
  - HTN
  - DM
- Allergy: NKA

## Physical Examination

- Consciousness: clear
- HEENT: neck supple
- Chest: mild wheezing breathing sound
- Abdomen: Soft, no tender point
- Extremities: freely movable

## Impression

- r/o occult infection

## Order DAY1 20:15

- Triage I
- O<sub>2</sub> mask 6~10L/min
- Combivent 1vial INH ST
- Solu-Medrol 120mg IV ST
- ABG (3)
- B/C x II
- WBC/DC/Hb, PLT
- BUN, Cr, Na, K, CRP
- N/S run 60ml/hr
- CXR, EKG
- F/S ( )
- Triage 改 II

## Order DAY1

- 20:30
- F/S showed HI
- NS 500ml IV challenge ST
- F/S O<sub>2</sub>H x 3次
- RI 10u IV ST
- ABG(3)改G(6)
- 生化加Cl, Osmo

pH	7.373
pCO <sub>2</sub>	27.9
pO <sub>2</sub>	82
BE	-9
HCO <sub>3</sub>	16.3
TCO <sub>2</sub>	17
SO <sub>2</sub>	96%
Na	120
K	4.7
Hct	33%
Hb	11.2

## CXR DAY1



## DAY1

檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值	Hi,Lo值	前次檢驗值
Hb	11.7	gm/dl	13.000	18.000	*L	15.5
WBC	11.0	x1000/uL	3.800	10.000	*H	8.9
Differential count	*****					*****
Segmented Neutro.	89.5	%	37.000	75.000	*H	40.5
Lymphocyte	7.5	%	20.000	55.000	*L	44.0
Monocyte	3.0	%	4.000	10.000	*L	10.0
Eosinophil	0.0	%	0.000	5.000		4.9
Basophil	0.0	%	0.000	2.000		0.6
Atypical lymphocyte	0.0	%	0.000	3.000		
Band	0.0	%	0.000	5.000		
Metamyelocyte	0.0	%	0.000	0.000		
Myelocyte	0.0	%	0.000	0.000		
Promyelocyte	0.0	%	0.000	0.000		
Elast	0.0	%	0.000	0.000		
Nucleated RBC	0.5	/100WBC	0.000	0.000		
Platelet	70	x1000/uL	140.000	450.000	*L	207

101/11/25

檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值	Hi,Lo值
Blood Ketone	0.9	mmol/L	0.000	0.600	*H

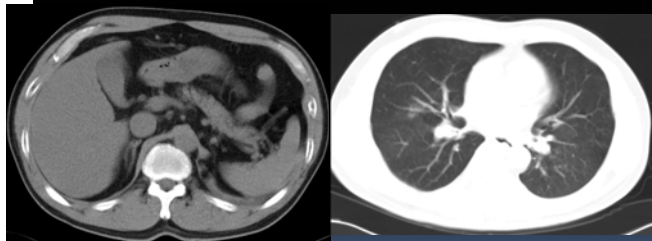
  

檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值	Hi,Lo值	前次檢驗值
BUN	68	mg/dL	8.000	20.000	*H	18
Creatinine	7.8	mg/dL	0.500	1.300	*H	1.4
eGFR	7.17					52.05
Cl	84	meq/L	96.000	108.000	*L	
Osmolality	313	mOsm/kg	278.000	305.000	*H	
CRP	20.300	mg/dL	0.000	0.500	*H	

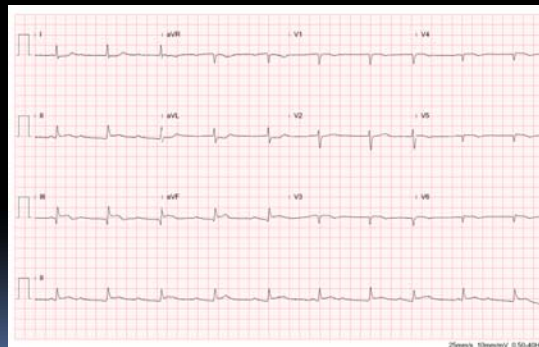
## Order DAY1 21:35 (1hr23min)

- F/S showed HI
- On line 2 with RI 50u in N/S 500ml run 60ml/hr with pump IV
- Flumarin 2 g IV ST
- Chest /Abdominal CT without contrast

## Chest/Abdominal CT without contrast



DAY1 22:27 (2hr15min)



Order DAY1 22:35 (2hr23min)

- On Foley
- 電聯總值for ICU evaluation
- On Critical
- 電聯CV Dr.張 for suspected AMI
- 補troponin I

Order DAY1

- 22:50 (2hr38min)
- ABG (3) ST for dyspnea
- PT/APTT
- 23:30 (3hr18min)
- Sent pt to Cath room on call
- On CVP

pH	7.380
pCO <sub>2</sub>	25.3
pO <sub>2</sub>	65
BE	-10
HCO <sub>3</sub>	15.0
TCO <sub>2</sub>	16
SO <sub>2</sub>	92%

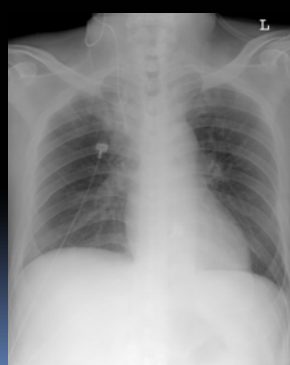
Order DAY1

- 23:30 (3hr18min)
- Tapal 3tab PO ST
- Plavix 4tab PO ST
- Heparin 400IU IV ST
- Lactate (from CVC)
- CXR (P)
- 23:56 (3hr44min)
- Sent pt to cath room

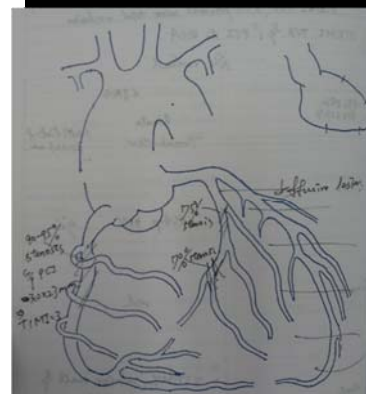
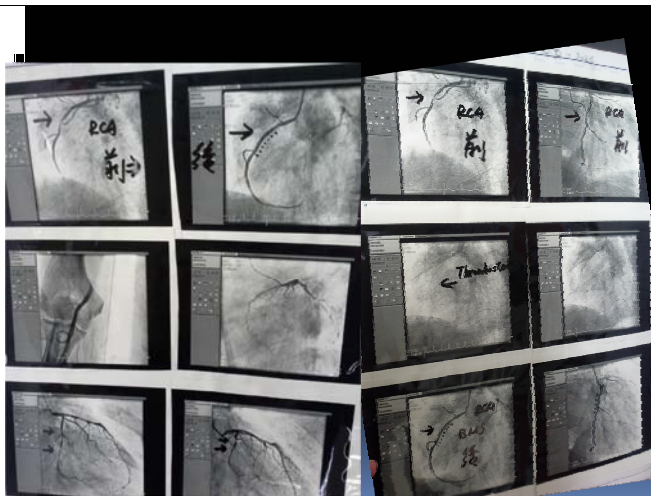
檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值	Hi,Lo值
PT	15.6	second	9.400	12.500	*H
Normal control	10.5	second			
INR	1.50	Ratio	0.800	1.200	*H
APTT	30.9	second	28.600	38.600	
Normal control	32.8	second			

PLT 70K, INR:1.5; CV Dr.張 電聯Dr. 陳隆朱, Agree Tapal/Plavix and Heparin use

Post CVP X-ray



檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值	Hi,Lo值
Lactate	26.6	mg/dL	4.500	19.800	*H

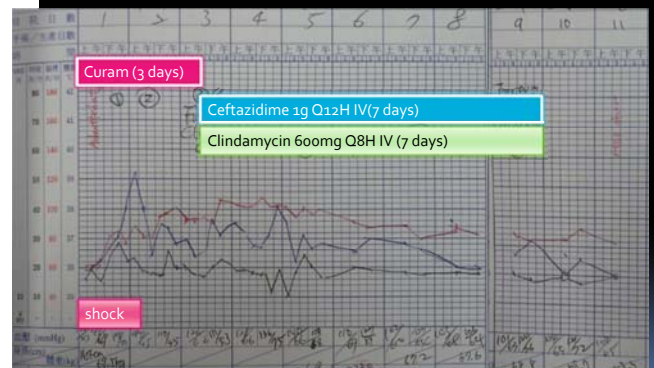


## Cath note

- STEMI, inferior wall with cardiogenic shock, s/p PCI with thrombo-suction and bare metal stent insertion to RCA proximal on DAY2
- Coronary artery disease, triple vessels, LAD diffuse atherosclerosis, LCX-proximal 75% stenosis, -middle 90% stenosis, RCA-proximal 95% stenosis with TIMI 1 flow

## Admission DAY2

- Tentative diagnosis
  - STEMI
  - Diabetes mellitus with diabetic ketoacidosis
  - Acute kidney injury, suspect dehydration related
  - Pulmonary tuberculosis under treatment



## DAY2

檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值	Hi,Lo值	前次檢驗值
BGL-C	25	mg/dL	20,000	67,000	*L	
T-choBGL-C	4.9	%	0.000	5.000		
LDL-C	83	mg/dL	0.000	130,000		
Total-cholesterol	123	mg/dL	0.000	220,000		
Triglyceride	123	mg/dL	50,000	130,000		
Mg	2.10	mg/dL	1.500	2.050		

檢驗項目名稱	檢驗值	檢驗值單位
HbA1C	11.70	%

Heart Echo:  
Inferior wall hypokinesia,  
EF:68%  
Trivial MR, AR, TR

檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值	Hi,Lo值	前次檢驗值
CRP	4.377	U/L	0.000	200,000	*H	
Na	129	mmol/L	133,000	145,000	*L	140
K	4.4	mmol/L	3.500	5.200		4.3
Cl	93	mmol/L	96,000	106,000	*L	88
Ca	4.01	mmol/L	3.500	5.000		
P	2.86	mg/dL	2.500	4.000		
Tropoin I	>100,000	ng/L	0.000	0.500	*H	>100,000
CK-MB	162	U/L	7,000	25,000	*H	

檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值	Hi,Lo值	前次檢驗值
CRP	3890	U/L	39,000	308,000	*H	
K	3.9	mmol/L	3.500	5.100		4.3
Tropoin I	>100,000	ng/L	0.000	0.500	*H	>100,000
CK-MB	142	U/L	7,000	25,000	*H	

檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值	Hi,Lo值	前次檢驗值
CRP	3111	U/L	39,000	308,000	*H	
K	3.9	mmol/L	3.500	5.100		4.3
Tropoin I	>100,000	ng/L	0.000	0.500	*H	>100,000
CK-MB	128	U/L	7,000	25,000	*H	

檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值	Hi,Lo值	前次檢驗值
CRP	2134	U/L	39,000	308,000	*H	
Tropoin I	>100,000	ng/L	0.000	0.500	*H	>100,000
CK-MB	62	U/L	7,000	25,000	*H	

## DAY3

檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值	Hi,Lo值	前次檢驗值
CRP	785	U/L	39,000	308,000	*H	2134
Tropoin I	40,929	ng/L	0.000	0.500	*H	>100,000
CK-MB	47	U/L	7,000	25,000	*H	92

檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值	Hi,Lo值	前次檢驗值
Lactate	15.6	mg/dL	4,500	19,800		26.6

檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值	Hi,Lo值	前次檢驗值
CRP	671	U/L	39,000	308,000	*H	2134
BUN	77	mg/dL	8,000	20,000	*H	68
Creatinine	6.3	mg/dL	0.500	1.300	*H	7.8
eGFR	9.18					7.17
Na	131	mmol/L	133,000	145,000	*L	129
K	4.4	mmol/L	3.500	5.100		3.9
Tropoin I	31,693	ng/L	0.000	0.500	*H	>100,000
CK-MB	38	U/L	7,000	25,000	*H	92



## DAY3



## DAY3→DAY5

- SPUTUM CULTURE AND GRAM'S STAIN:
- GRAM'S STAIN:
- PMN 10-25 /LPF
- Squamous epithelial <10 /LPF
- Organism:
- 1. *Klebsiella pneumoniae* --- Few
- 2. *Candida albicans* --- Few

## DAY4

檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值	Ht,Lo值	兩次檢驗值
Hb	11.3	gm/dl	13.000	18.000	*L	11.7
WBC	11.2	x1000/hl	3.800	10.000	*H	11.0
Differential count	*****					*****
Segmented Neutro.	79.0	%	37.000	75.000	*H	89.5
Lymphocyte	10.5	%	20.000	55.000	*L	7.5
Monocyte	1.5	%	4.000	10.000	*L	3.0
Eosinophil	0.0	%	0.000	5.000		0.0
Basophil	0.0	%	0.000	2.000		0.0
Atypical lymphocyte	0.0	%	0.000	3.000		0.0
Band	9.0	%	0.000	5.000	*H	0.0
Metamyelocyte	0.0	%	0.000	0.000		0.0
Myelocyte	0.0	%	0.000	0.000		0.0
Promyelocyte	0.0	%	0.000	0.000		0.0
Elast	0.0	%	0.000	0.000		0.0
Nucleated RBC	0.0	/100WBC	0.000	0.000		0.5
Platelet	113	x1000/hl	140.000	450.000	*L	70

## DAY4

檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值	Ht,Lo值	兩次檢驗值
DOT(AST)	376	U/L	5.000	35.000	*H	24
OPT(ALT)	1418	U/L	10.000	50.000	*H	18
γ-GT	181	U/L	4.000	60.000	*H	
T-Bilirubin	0.6	mg/dL	0.200	1.300		0.5
BUN	77	mg/dL	8.000	20.000	*H	77
Creatinine	5.9	mg/dL	0.500	1.300	*H	6.3
eGFR	9.90					9.18
Na	148	mmol/L	133.000	145.000	*H	131
K	3.9	mmol/L	3.300	5.300		4.4
Lipase	268	U/L	13.000	60.000	*H	

Consult INF: Pneumonia,  
Give Fortum and  
Clindamycin

Consult GI: Abnormal  
liver function r/o shock  
episode related, arrange  
abdominal echo, check  
HBC/HCV

檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值
HBsAg	0.621	COI	0.000	1.000
Anti-HCV	0.07	S/CO	0.000	0.999

## DAY5

檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值	Ht,Lo值	兩次檢驗值
DOT(AST)	101	U/L	5.000	35.000	*H	376
OPT(ALT)	828	U/L	10.000	50.000	*H	1418
γ-GT	206	U/L	4.000	60.000	*H	181
BUN	31	mg/dL	8.000	20.000	*H	77
Creatinine	1.9	mg/dL	0.500	1.300	*H	5.9
eGFR	36.59					9.90
Na	142	mmol/L	133.000	145.000		148
K	4.0	mmol/L	3.300	5.300		3.8
Lipase	248	U/L	13.000	60.000	*H	268

Abd echo: right  
PLE

## B/C DAY1→DAY10

- PRELIMINARY BLOOD CULTURE REPORT:
  - No microorganism grow in 3 days cultured and final report pending.
- FINAL BLOOD CULTURE REPORT:
  - No microorganism grow in 7 days cultured.

## DAY10

檢驗項目名稱	檢驗值	檢驗值單位	最小參考值	最大參考值	Ht,Lo值	兩次檢驗值
CBCHDC	*****					*****
WBC	8.2	X1000/hl	3.800	10.000		10.5
RBC	3.76	million	4.500	5.700	*L	5.17
Hb	11.1	gm/dL	13.000	18.000	*L	11.3
Ht	32.8	%	40.000	54.000	*L	45.0
MCV	87.2	fL	81.000	98.000		87.0
MCH	29.5	pg	27.000	32.000		30.0
MCHC	33.8	%	32.000	36.000		34.4
RDW	12.9	%	11.500	14.500		13.5
Differential count	*****					*****
Segmented Neutro.	65.0	%	37.000	75.000		70.2
Lymphocyte	19.0	%	20.000	55.000	*L	14.8
Monocyte	12.0	%	4.000	10.000	*H	13.7
Eosinophil	1.0	%	0.000	5.000		1.1
Basophil	0.0	%	0.000	2.000		0.2
Atypical lymphocyte	0.0	%	0.000	3.000		0.0
Band	3.0	%	0.000	5.000		9.0
Metamyelocyte	0.0	%	0.000	0.000		0.0

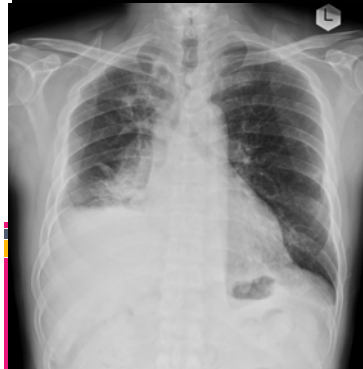
## DAY10

檢驗項目名稱	檢驗值	檢驗單位	最小參考值	最大參考值	H/L	備次檢驗值
GOT(ALT)	42	U/L	5,000	35,000	*H	101
GPT(ALT)	320	U/L	10,000	50,000	*H	828
AST	122	U/L	4,000	63,000	*H	206
BUN	20	mg/dL	8,000	20,000		31
Creatinine	1.4	mg/dL	0.500	1.300	*H	1.9
eGFR	52.05					36.59
Na	138	mmol/L	133,000	145,000		142
K	3.7	mmol/L	3,300	5,100		4.0
Lipase	257	U/L	13,000	60,000	*H	248

### DAY13

檢驗項目名稱	檢驗值	檢驗單位	最小參考值	最大參考值	H/L	備次檢驗值
GOT(ALT)	33	U/L	5,000	35,000		42
GPT(ALT)	163	U/L	10,000	50,000	*H	320
AST	92	U/L	4,000	63,000	*H	122
T-Bilirubin	0.4	mg/dL	0.200	1.300		0.6
BUN	19	mg/dL	8,000	20,000		20
Creatinine	1.3	mg/dL	0.500	1.300		1.4
eGFR	56.70					52.05
Na	137	mmol/L	133,000	145,000		138
K	4.8	mmol/L	3,300	5,100		3.7
Lipase	169	U/L	13,000	60,000	*H	257
CRP	1.740	mg/dL	0.000	0.500	*H	20.300

## DAY13



- DAY10 chest echo:
- Right lower lung atelectasis

## Discharge DAY13

- Final diagnosis:
  - STEMI s/p PCI and stent
  - Pneumonia, right lower lobe with lower lobe collapse, improved
  - Diabetes mellitus with diabetic ketoacidosis, improved
  - Acute kidney injury, resolved
  - Pulmonary tuberculosis under treatment
  - Asthma

## DISCUSSION

- DKA
- Troponin I

## Signs and symptoms of DKA

- early symptoms: polydipsia and polyuria.
- Malaise, generalized weakness, and fatigability
- Nausea, vomiting; diffuse abdominal pain(+/-) decreased appetite, and anorexia
- Decreased perspiration
- Altered consciousness (eg, mild disorientation, confusion); frank coma is uncommon but may occur when the condition is neglected or with severe dehydration/acidosis

### Diagnostic criteria for diabetic ketoacidosis (DKA) and hyperosmolar hyperglycemic state (HHS)

	DKA			HHS
	Mild	Moderate	Severe	
Plasma glucose (mg/dL)	>250	>250	>250	>600
Arterial pH	7.25 to 7.30	7.00 to 7.24	<7.00	>7.30
Serum bicarbonate (mEq/L)	15 to 18	10 to <15	<10	>18
Urine ketones*	Positive	Positive	Positive	Small
Serum ketones*	Positive	Positive	Positive	Small
Effective serum osmolality (mOsm/kg)*	Variable	Variable	Variable	>320
Anion gap <sup>‡</sup>	>10	>12	>12	Variable
Alteration in sensoria or mental obtundation	Alert	Alert/drowsy	Stupor/coma	Stupor/coma

DKA diagnostic criteria: serum glucose >250 mg/dl, arterial pH <7.3, serum bicarbonate <18 mEq/L, and moderate ketonuria or ketonemia.

\* Nitroprusside reaction  
 ‡ Calculation: 2[meq/L Na+] - [meq/L Cl-]  
 Copyright © 2006 Am. Diab. Assn.  
 Issue 12, 2006. Information updated from Kitabchi AE, Umpierrez GE, Miles JM, Fisher JN. Hyperglycemic crises in adult patients with diabetes. Diabetes Care 2009; 32:1335.  
 Reprinted with permission from the American Diabetes Association.

## Predisposing or precipitating factors for diabetic ketoacidosis and hyperosmolar hyperglycemic state

DKA	HHS
Inadequate insulin treatment or noncompliance	Inadequate insulin treatment or noncompliance (21 to 41 percent)
New onset diabetes (20 to 25 percent)	Acute illness
Acute illness	Infection (32 to 60 percent)
Infection (30 to 40 percent)	Pneumonia
Cerebral vascular accident	Urinary tract infection
Myocardial infarction	Sepsis
Acute pancreatitis	Cerebral vascular accident
Drugs	Myocardial infarction
Chlorzoxipine or olanzapine	Acute pancreatitis
Cocaine	Acute pulmonary embolus
Lithium	Intestinal obstruction
Terbutaline	Dialysis, peritoneal
	Mesenteric thrombosis
	Renal failure
	Heat stroke
	Hypothermia
	Subdural hematoma
	Severe burns

## Predisposing or precipitating factors for diabetic ketoacidosis and hyperosmolar hyperglycemic state

DKA	HHS
	Endocrine
	Acromegaly
	Thyrotoxicosis
	Cushing's syndrome
	Drugs/therapy
	Beta-Adrenergic blockers
	Calcium-channel blockers
	Chlorpromazine
	Chlorthalidone
	Cimetidine
	Clozapine
	Diazoxide
	Ethacrynic acid
	Immunosuppressive agents
	L-asparaginase
	Levamisole
	Olanzapine
	Phenothiazines
	Proparacetamol
	Steroids
	Thiazide diuretics
	Total parenteral nutrition
	Previously undiagnosed diabetes

DKA = diabetic ketoacidosis; HHS = hyperosmolar hyperglycemic state.  
Data from: Kitabchi AE, Umpierrez GE, Murphy MB, et al. Management of hyperglycemic crises in patients with diabetes mellitus (Technical Review). Diabetes Care 2001; 24:121.

UpToDate

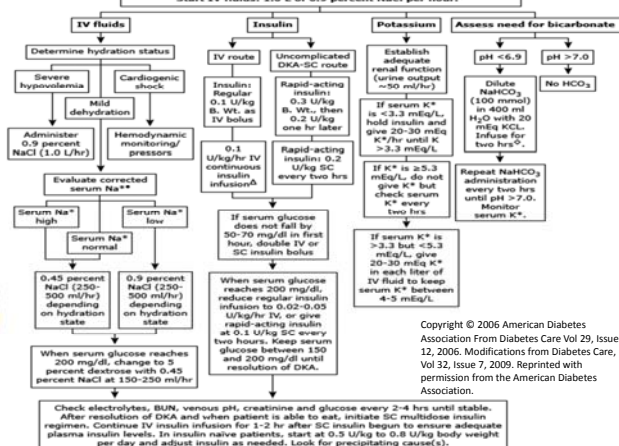
## Lab testing

- Serum glucose levels
- Serum electrolyte levels (eg, potassium, sodium, chloride)
- Amylase levels
- Urine dipstick
- Ketone levels
- Serum or capillary beta-hydroxybutyrate levels
- ABG measurements
- Bicarbonate levels
- CBC count
- BUN and creatinine levels
- Urine and blood cultures if intercurrent infection is suspected
- ECG (or telemetry in patients with comorbidities)

## Imaging tests

- Chest radiography:** To rule out pulmonary infection such as pneumonia
- Head CT scanning:** To detect early cerebral edema;
  - use low threshold in children with DKA and altered mental status
- Head MRI:** To detect early cerebral edema
  - (order only if altered consciousness is present)

## Complete initial evaluation. Check capillary glucose and serum/urine ketones to confirm hyperglycemia and ketonemia/ketonuria. Start IV fluids: 1.0 L of 0.9 percent NaCl per hour.\*



## Elevations of cardiac troponin in the absence of overt ischaemic heart disease

### Damage related to secondary myocardial ischaemia (MI type 2)

- Tachy- or bradyarrhythmias
- Aortic dissection and severe aortic valve disease
- Hypo- or hypertension, eg, haemorrhagic shock, hypertensive emergency
- Acute and chronic heart failure without significant concomitant coronary artery disease (CAD)
- Hypertrophic cardiomyopathy
- Coronary vasculitis, eg, systemic lupus erythematosus, Kawasaki syndrome
- Coronary endothelial dysfunction without significant CAD, eg, cocaine abuse

### Damage not related to myocardial ischaemia

- Cardiac contusion
- Cardiac incisions with surgery
- Radiofrequency or cryoablation therapy
- Rhabdomyolysis with cardiac involvement
- Myocarditis
- Cardiotoxic agents, eg, anthracyclines, herceptin, carbon monoxide poisoning
- Severe burns affecting >30 percent of body surface

### Elevations of cardiac troponin in the absence of overt ischaemic heart disease

#### Indeterminant or multifactorial group

Apical ballooning syndrome
Severe pulmonary embolism or pulmonary hypertension
Peripartum cardiomyopathy
Renal failure
Severe acute neurological diseases, eg, stroke, trauma
Infiltrative diseases, eg, amyloidosis, sarcoidosis
Extreme exertion
Sepsis
Acute respiratory failure
Frequent defibrillator shocks

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### Positive troponin in diabetic ketoacidosis without evident acute coronary syndrome predicts adverse cardiac events.

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#### Abstract

**BACKGROUND:** Elevated troponin I has been associated with increased mortality in critically ill patients without acute coronary syndrome (ACS). However, the prognostic significance of troponin elevation in patients with diabetic ketoacidosis (DKA) without evident ACS has not been studied.

**METHODS:** Retrospective study of all patients admitted to a U.S. tertiary center between 01/98 and 12/00 with DKA and had troponin I level measured. Patients with evidence of ACS or who met the American College of Cardiology/European Society of Cardiology (ACC/ESC) definition for myocardial infarction were excluded. Baseline characteristics, cardiac evaluation and 2 year major adverse coronary event (MACE) rate were compared between patients with positive and negative troponin.

**RESULTS:** Ninety-six patients fulfilled the inclusion criteria of this study, 26 had positive troponin. There were no differences in baseline characteristics between the two groups. After a 2 year follow-up, there was significantly increased mortality in patients with elevated troponin (50.0% versus 27.1%, hazard-ratio (HR) 2.3, 95% confidence interval (CI) 1.2-4.8,  $p = 0.02$ ). Patients with elevated troponin also had significantly increased MACE rate at 2 years (50.0% versus 28.6%, HR 2.6, 95% CI 1.3-5.3,  $p = 0.007$ ) driven primarily by mortality. Using Cox Proportional Hazard Analysis, elevated troponin was a predictor of increased MACE after adjusting for confounding variables. (Adjusted HR 2.3, 95% CI 1.1-4.6,  $p = 0.02$ ).

**CONCLUSIONS:** Elevated troponin I in diabetic ketoacidosis (DKA) identifies a group at very high risk for future cardiac events and mortality. Whether cardiac risk stratification of these patients will improve long term outcome remains to be studied.

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THE END