

# Renal Compromise in the obstetric patient

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## 2 types of patients

- AKI – rare, usually in context of PET
- CKD – common, should influence your management – fluids / drugs / BP
- AKI on background of CKD – bad!

## The talk in one slide

- Don't give NSAIDs
- Don't fluid overload – pulmonary oedema kills, AKI usually recovers
- If in doubt, call a nephrologist!

# Renal compromise

- 30 year old senior staff nurse
- Para 0
- Familial FSGS
- Stable renal function pre conception – creatinine ~150, eGFR ~ 35-40ml/mins (CKD 3)
- Stopped ARB pre- pregnancy
- Severe white coat hypertension

# What do you need to know?

- Baseline renal function
- Rate of change
- Proteinuria
- BP
- FBC and film
- Renal USS

# Causes of renal impairment in pregnant patient

- Acute Kidney Injury (AKI)
  - Hyperemesis
  - PET
  - HELLP
  - AFLP
  - Sepsis (including pyelo)
  - Haemorrhage
  - Obstruction
  - Rarely intrinsic renal disease
  - Very rarely HUS
- Chronic kidney disease (CKD)
  - May be first manifestation
- \*Acute on Chronic KD\*

# Principles of management

- Understand what is normal
- Understand what has gone wrong – rate of change / cause and correct what reversible
- **Support the patient** – aiming to maintain O<sub>2</sub> and perfusion
  - Fluids – monitored (in and out)
  - Diuretics – if full
  - Electrolytes – monitor;
  - BP – PET protocols
  - DON'T GIVE NSAIDS
  - Nephrologist

# AKI

- Now on the national agenda – NECEPOD report 2009
- Even mild AKI associated with significantly worse outcomes – in general population
- Avoid progression to acute renal failure
  - Identify those at risk
  - Get the volume right but beware pulmonary oedema
  - Get rid of toxic drugs and modify dosages where necessary
  - Treat the underlying cause

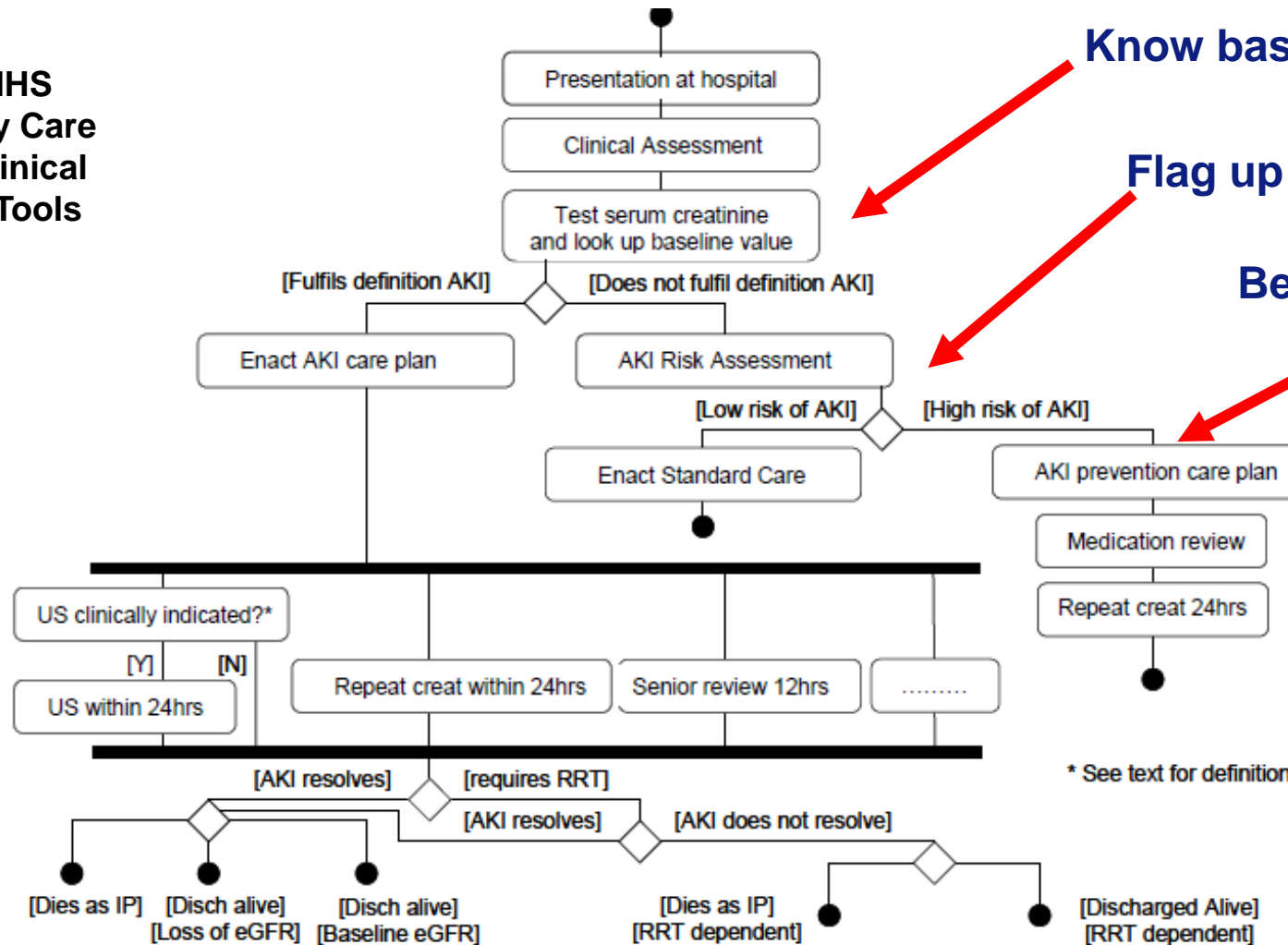


# KDIGO staging classification of AKI

Stage	Serum Creatinine criteria	Urine output criteria
1	Increase $>26\mu\text{mol/L}$ within 48 hrs OR	$<0.5\text{ml/kg/hr}$ for $>6$ consecutive hours
	Increase $>1.5-1.9 \times$ ref serum Creatinine	
2	Increase $>2$ to $2.9 \times$ reference S Cr	$<0.5\text{ml/kg/hr}$ for $>12$ consecutive hours
	Increase $>3 \times$ reference S Cr OR	
3	increase $>354\mu\text{mol/l}$	$<0.3\text{ml/kg/hr}$ for $>24$ hrs or anuria for 12hrs
	Commenced on RRT irrespective of stage	

# Principles of prevention and mx of AKI

2011 NHS  
Kidney Care  
AKI Clinical  
Audit Tools



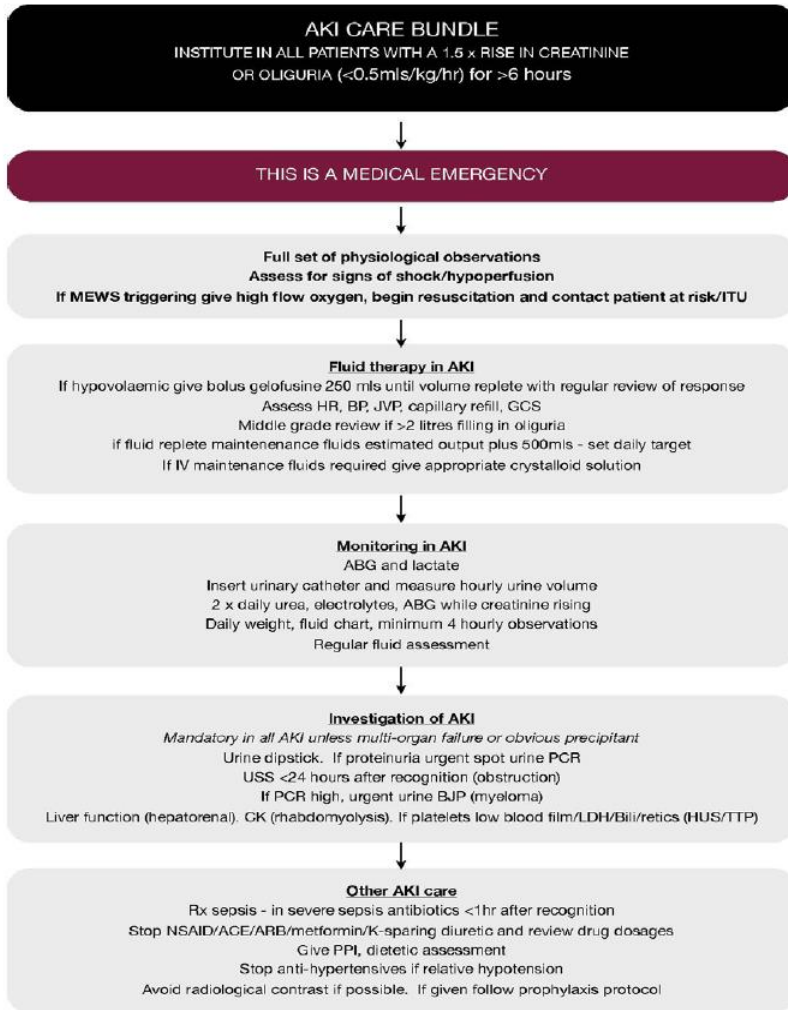
Know baseline!

Flag up at risk (CKD)

Be prepared

\* See text for definition

# Pregnant patients same but different



- Normal creatinine lower
- May already have impaired function with proteinuria and hypertension
- **Key principles the same:**
- Ensure oxygenation and perfusion
- Get the fluids right
- Monitor in and out
- Avoid nephrotoxins
- Make the diagnosis
- Involve a nephrologist!

## Normal pregnancy: GFR increases and creatinine falls

- Early pregnancy creatinine falls significantly and stays low

	creatinine	urea
Non pregnant	73umol/l (0.82mg/dl)	4.3mmol/l (25mg/dl)
Pregnant	51umol/l (0.5mg/dl)	3.3mmol (20mg/dl)

- Towards term, creatinine rises towards baseline
- Be suspicious...

# Acute renal failure is rare

- Is usually preventable if haemodynamic in origin
- “Early recognition and appropriate management of renal impairment and oliguria is important to avoid the development of acute renal failure” – Nelson-Piercy, 2006
- Institute fluids / inotropes / specific Rx (eg antibiotics for sepsis) as required
- BUT always put the patient before the kidneys – ATN recovers (usually); pulmonary oedema can kill...
- Is much more common in those with underlying renal disease – treat all as high risk

# Acute kidney injury requiring dialysis in obstetric patients: a series of 55 cases in Brazil.

Silva GB Jr et al Arch Gynecol Obstet 2009: 279:131

All patients requiring dialysis for AKI in obstetric unit 2000-2006

- N= 55 patients; average age 26.2 +/- 6.7 years.

Causes:

- PET 41.8%
- HELLP 40%
- puerperal sepsis 14.5%
- abruption 9.1%
- HUS / TTP 9.1% / 5.5%.
- Outcomes:
  - Oliguria 65%.
  - Death in 17 cases 30.9%.
- Factors associated with oliguria were, diagnosis of HELLP syndrome, hyperbilirubinemia and death.
- Factors associated with death were, presence of puerperal sepsis, hyperbilirubinemia, hypotension, oliguria and low levels of HCO(3).

# Analysis of maternal morbidity and mortality among patients admitted to Obstetric Intensive Care with severe PET, eclampsia or HELLP syndrome.

Curiel-Balsera E et al Med Intensiva 2011 epub Jun 22nd

262 patients admitted due to severe preeclampsia, eclampsia or HELLP syndrome.

- mean age  $30.47 \pm 5.7$  years; average gestation at admission 31.85/40+/- 4.45
- 63% nulliparous, low rates of comorbidity

Diagnoses:

- Severe PET – 78%
- HELLP 16%
- Eclampsia 6%

Global complication rate 14%

- 9% heart failure,
- **5% acute renal failure**
- 2% coagulopathy
- Maternal mortality was 1.5% (4 patients)

Acute kidney injury is rare these days; the most frequent problematic patients are those with chronic kidney disease (CKD)

- Ideally all will have had pre-pregnancy counselling and optimised care
- All will have a plan in place for management during pregnancy and delivery
- Complications will be identified early
- Fetal welfare monitored with growth scans
- Maternal welfare monitored regularly throughout pregnancy
- Very rarely advise not to proceed with pregnancy...



In reality, many women with CKD present during pregnancy with little or no planning!

- May be the first presentation
  - May be unaware of risk to fetus and mother
  - Things can go wrong quite quickly
  - It's difficult to diagnose PET
  - Increased risk of IUGR and pre term birth
- 
- Be alert
  - Be careful
  - Monitor carefully
  - Involve your renal team

# Adverse Outcomes if CKD and pregnant

## Maternal

- Hypertension
- Pre-eclampsia
- Deteriorating renal function
- Increased risk of CS/operative delivery

## Fetal

- Prematurity
  - Spontaneous
  - Iatrogenic
- Small for gestational age
- Low Birth Weight
- Increased Neonatal Mortality

# Increasing comorbidity / worse renal function in women coming to obstetric renal clinic

- Impaired fertility
- Increasing age
- Severe prior lupus nephritis
- Complex transplantation
- Advanced CKD including those on dialysis
- Multiple medications
  
- The art is planning – think about it in advance – always
- Requires multidisciplinary care – collaborative
- Plan delivery – consider coagulation / access / BP / drugs

# Pre-Existing Renal Disease in Pregnancy: Renal outcomes - Loss of >25% renal function

Creatinine (mmol/l)*	During pregnancy %	Persists post-partum %	ESRF after 1 year %
Cr <125	2	0	0
Cr 125-180	40	20	2
>180	70	50	35

\* mean pre pregnancy serum creatinine value umol/l

Estimates are based on literature from 1985-2007, with all pregnancies achieving at least 24 weeks gestation

## Pre-Existing Renal Disease in Pregnancy: Fetal impact

Creatinine (mmol/l)*	Fetal growth restriction	PET %	Preterm delivery %	Perinatal deaths %
<125	25	22	30	1
125-180	40	40	60	5
>180	65	60	>90	10
on dialysis	>90	75	>90	50 (higher if on dx at conception)

\* mean pre pregnancy serum creatinine value  $\mu\text{mol/l}$

Estimates are based on literature from 1985-2007, with all pregnancies achieving at least 24 weeks gestation

Williamson D and Davison J 2008 *BMJ* 336: 211-5

# Fetal Outcome with maternal with mild/moderate renal insufficiency

- Survey of 120000 birth records
- 82 women with chronic renal disease identified
  - Confirmed that  $\text{Cr} \leq 124\mu\text{mol/l}$  was associated with live outcomes similar to that background
  - Demonstrated  $\text{Cr} \geq 97\mu\text{mol/l}$  was associated with significant rise in premature birth

**Modena A et al. Am J Obstet Gynecol. 2006. 193: S86.**

# Pregnancies in women with severe CKD - ? common

- Typical QCH Obs Renal Clinic
  - 21 patients
  - CKD 1 in 9 patients (reflux 4, donor, FSGS 2, lupus , IgA)
  - CKD 2 in 3 including 1 transplant
  - CKD 3 in 4 including 1 transplant
  - CKD 4 in 3 including 2 transplants
  - CKD 5 in 2 patients
- Very high risk population
- Can we predict who will do badly?

# Maternal and Fetal Outcome with moderate/severe renal insufficiency

Imbasciati E AJKD 2007, 49: 753

Prospective multi-centre cohort study

49 Non-diabetic white women

- Gestation > 20 weeks
- GFR (MDRD-4) < 60 ml/min/1.73m<sup>2</sup>
- Average of 39 months postpartum follow up

Conception Cr 186 ± 88 µmol/l (eGFR 35 ± 12)

GFR < 40 **AND** proteinuria > 1g/24hrs before conception predict:

- shorter time to dialysis or halving of GFR (HR 5.2; 95% 1.7-15.9)
- low birth weight (OR 5.1, 1.03-25.6)



# Prospective study of women with CKD

- 36 women with CKD (creatinine >125umol/L pre preg or >100umol/L at booking)
- or Proteinuria >500mg/24hrs
- 30 women with 2+ proteinuria and known risk for PET

	<b>Mild CKD</b>	<b>Mod CKD</b>	<b>Proteinuria + risk PET</b>
PET	40%		60%
Pre Term delivery	54%	86%	40%
SGA (<10 <sup>th</sup> centile)	64%		27%
Perinatal death	5%	14%	

# Maternal and fetal outcomes with moderate /severe renal insufficiency

Retrospective analysis of 82 pregnancies in 67 women.

	1st Trimester	3 <sup>rd</sup> Trimester	
S Creatinine μmol/l	168 ±71	221±115	P<0.001
% Frequency of MBP>105mmHg	28%	48%	P=0.01
Frequency of Proteinuria > 3g/l	23%	41%	P=0.007

Jones & Hayslett. NEJM. 1996 335:226-232

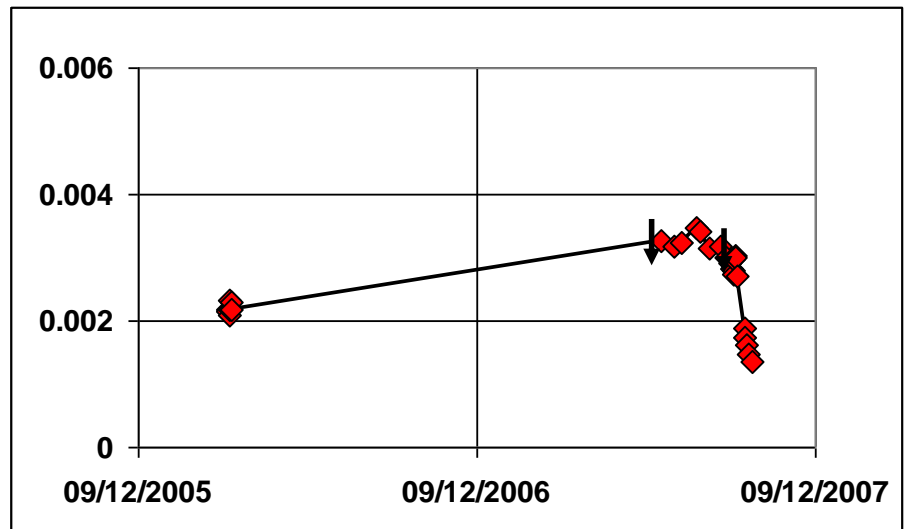
# Influence of creatinine on outcome

Jones and Hayslett NEJM 1996

## Creatinine >180 at conception

- 50% stable
- 30% decline through pregnancy and after
- 8% worse in pregnancy and better 6/12 pp
- 10% decline 6/52 to 6/12 post partum

**Patient with prior AKI, left with CKD,  
Baseline creatinine 300, unplanned  
Pregnancy, NVD 36/40**



# Pregnancy in renal transplant recipients

## Recent data – UK National Cohort Study

- Identified pregnant women with a transplant through UKOSS Jan 1 2007-Dec 31 2009
- 105 pregnancies in 101 recipients
- Median pre pregnancy creatinine was 118umol/l
- PET in 24% vs 4% of comparison group
- Median gestation at delivery 36/40 with 52% <37/40 (vs 8% national rate)
- 24% infants small for gestational age (<10<sup>th</sup> centile)
- 2 cases (2%) with acute rejection

## Predictive of poor outcomes:

- >1 previous kidney transplant,
- 1<sup>st</sup> trimester serum creatinine >125umol/l
- DBP >90 in second and third trimesters

# General principles

- If not on antihypertensives likely to do well
- If on EPO will need a lot more
- If not on EPO, likely to need
- If at increased risk of PET, they should be on aspirin
- If proteinuria heavy, need anticoagulation
- Look for early fall in creatinine (don't use eGFR)
- Can aim for NVD
- Can have epidural providing platelets ok/ LMWH stopped
- Need MDT care – obstetricians, nephrologists, expert midwives and anaesthetists..

## Advanced CKD / on dialysis and pregnancy

- Very high risk
- Absence of hypertension appears to be the single most important good prognostic outcome

# The Dialysis Patient

- Incidence of pregnancy
  - chronic dialysis - 0.44%
  - transplanted patients - 20%

Toma et al. NDT. 1999

- More recently - 1-7%
- Epo - positive effects on pituitary-adrenal and pituitary-gonadal axis
  - increase in sex drive
  - return of menses

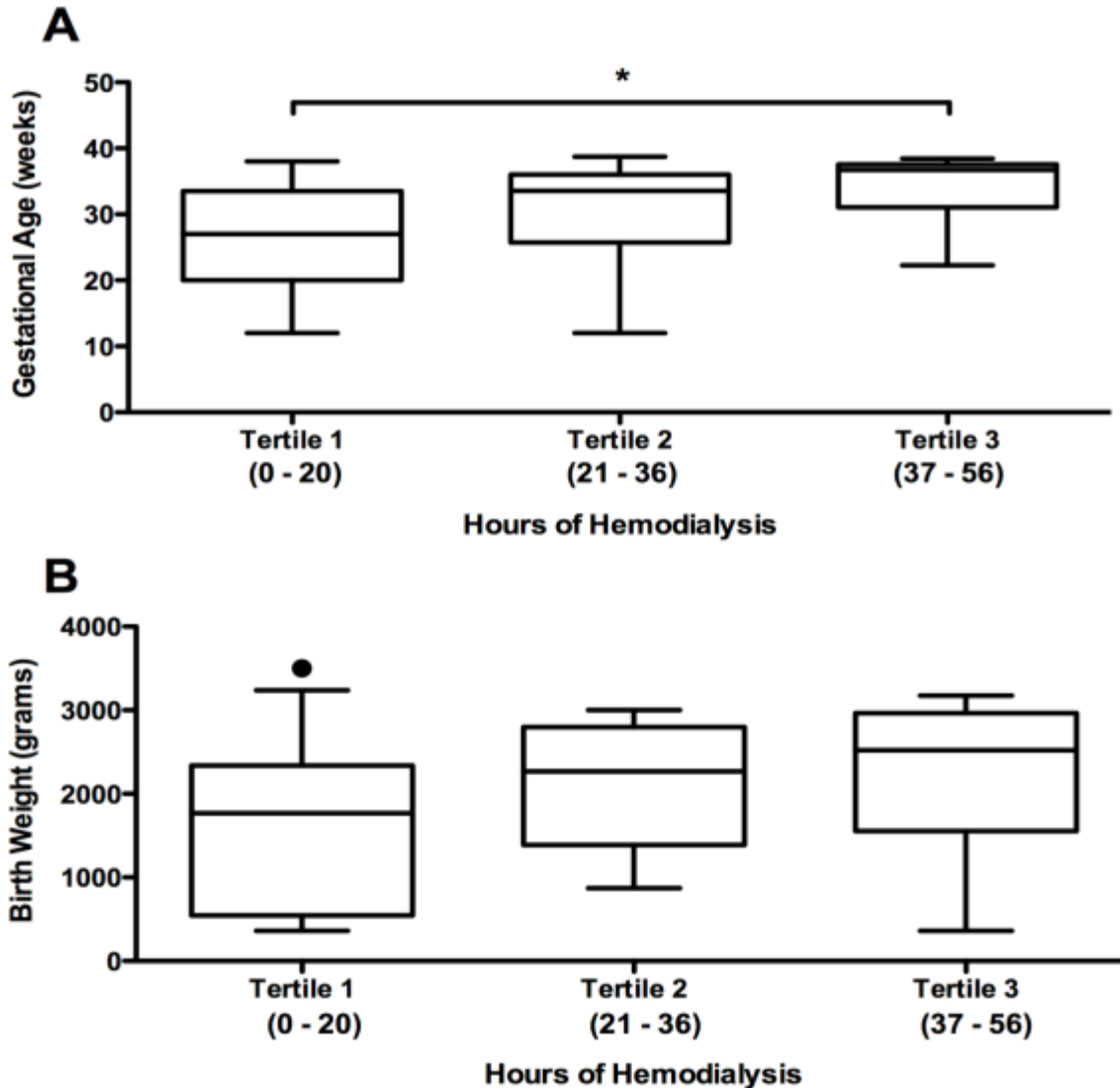
# Pregnancy in patients on dialysis

- Aim for urea  $<18$  - daily HD if necessary
- Mimic pregnancy:
  - Weight gain
  - Increased volume of N pregnancy, avoid high flux UF
  - N pregnancy, Na and Bicarb
- Increase EPO
- Control BP – aim for diastolic  $<100$ mmHg
- May need to anticoagulate
- Monitor fetus during dialysis from 26/40 (risk of provoking pre-term labour)



# Toronto data – more dialysis is better

Live birth rate 82% vs 53% p 0.028



- The proportion of live infants and median gestational age were higher in the Canadian cohort as compared to controls derived from the *ARPD*, while keeping maternal and neonatal complications minimal and manageable.
- > 36 hours of hemodialysis is necessary to optimize pregnancy outcome.
- Dialysis intensity should however be adjusted to account for the degree of residual renal function.

# Improving Outcomes

- Improved maternal health
  - dialysis adequacy and prescription
  - nutrition
  - anaemia management
  - hypertension management
- Improved neonatal outcomes
- Recent patient – patient with third pregnancy on dialysis!

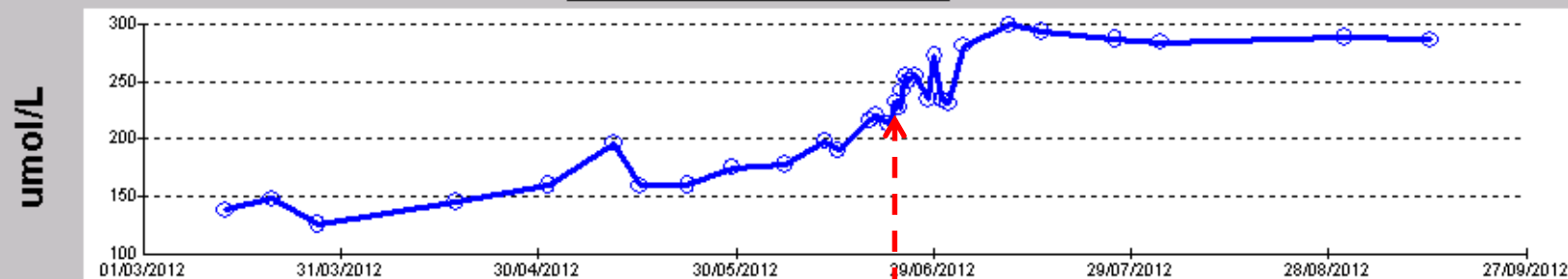
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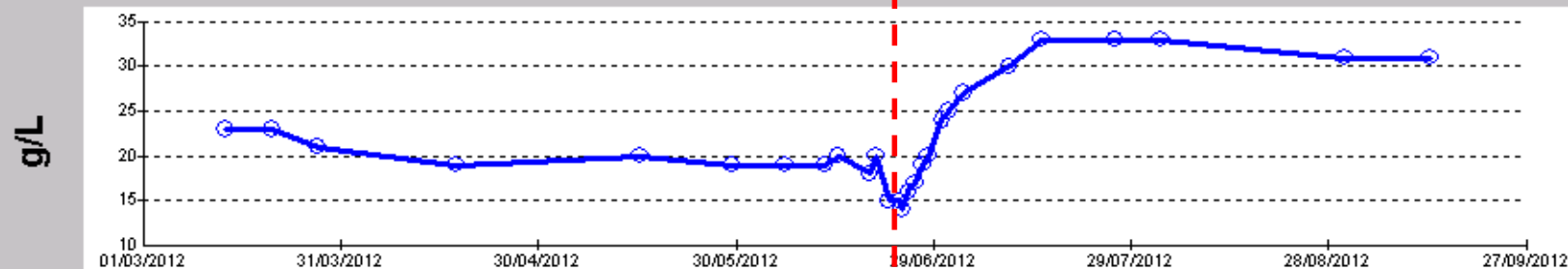
## Renal compromise

- Urine PCR in early pregnancy (had had PCC) 500, rapidly rising to 800
- Tried tacrolimus but prompt decline in function
- Rising creatinine through latter part of pregnancy

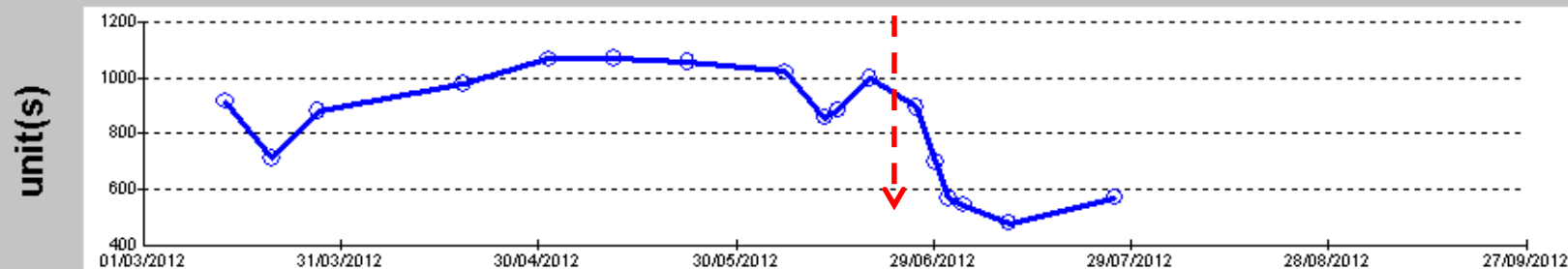
### Creatinine level, blood



### Albumin level, blood



### Protein:creatinine ratio, urine



## Progressive rise in creatinine; massive proteinuria

- Given high dose steroids for fetal lung maturity
- Regular growth scans
- Baby had ? Ventriculomegaly.
  
- Seen almost weekly throughout pregnancy
  
- 35/40 – CS due to rising creatinine, marked oedema and hypertension
- 2.16kg baby boy, apgars 9 and 9
- 24 hours later.....

## 24 hours later

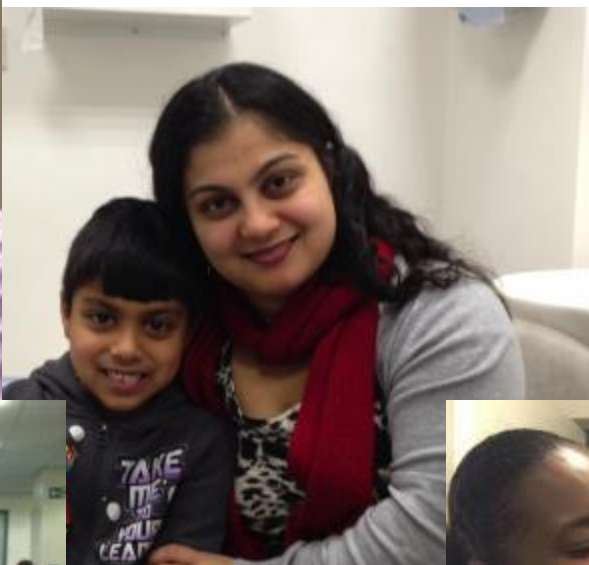
- Acute cortical blindness
- BP 230/140
- MRI suggested PRES
  
- Rx IV hydralazine and labetalol
  
- All resolved within 24 hours.

## Current status 2 years post partum

- On dialysis for ~18 months
- Worked up for transplantation /home haemo.
- She has no regrets – she has her lovely baby boy.



# Plan for success!



# Lessons

- Counselling!!!
- Follow up postnatally



# Summary

- Major determinant of outcome is hypertension; normotensive patients do much better
- Bad renal function is associated with poorer obstetric outcomes
- All health care professionals looking after women with CKD / transplant /on dialysis of child bearing age need to consider whether if these women plan to get pregnant.
- All patients should be offered prepregnancy counselling
- Renal compromise requires immaculate attention to detail – BP, fluids, drugs, input and output
- All patients diagnosed with renal disease in pregnancy need renal review post partum and a care plan instituted.

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