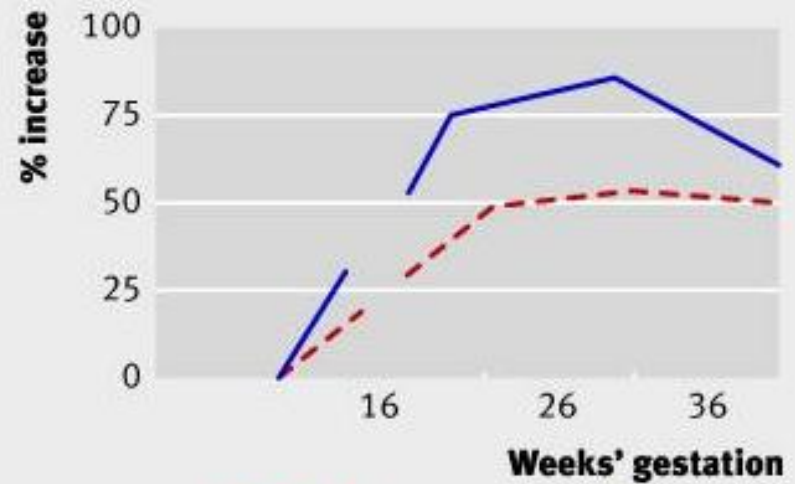




# Pregnancy And Chronic Kidney Disease

## Renal blood flow and glomerular filtration rate changes in pregnancy

- Effective renal plasma flow
- - - Glomerular filtration rate



### Renal haemodynamics

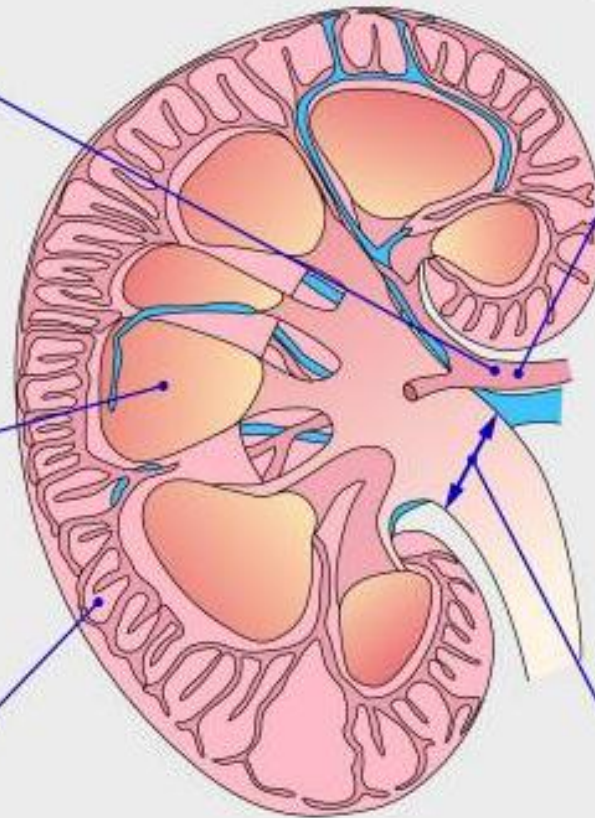
- ↑ Renal blood flow (70%)
- Plethoric kidney swells
- ↑ Bipolar diameter (1cm)
- ↑ Glomerular filtration rate (50%)
- ↑ Proteinuria ( $\leq$  260 mg/24 h)

### Tubular function

- ↑ Glycosuria
- ↑ Bicarbonaturia (metabolic acidosis)
- ↑ Calciuria
- ↓ Plasma osmolality ( $\downarrow$  10 mosmol/kg)

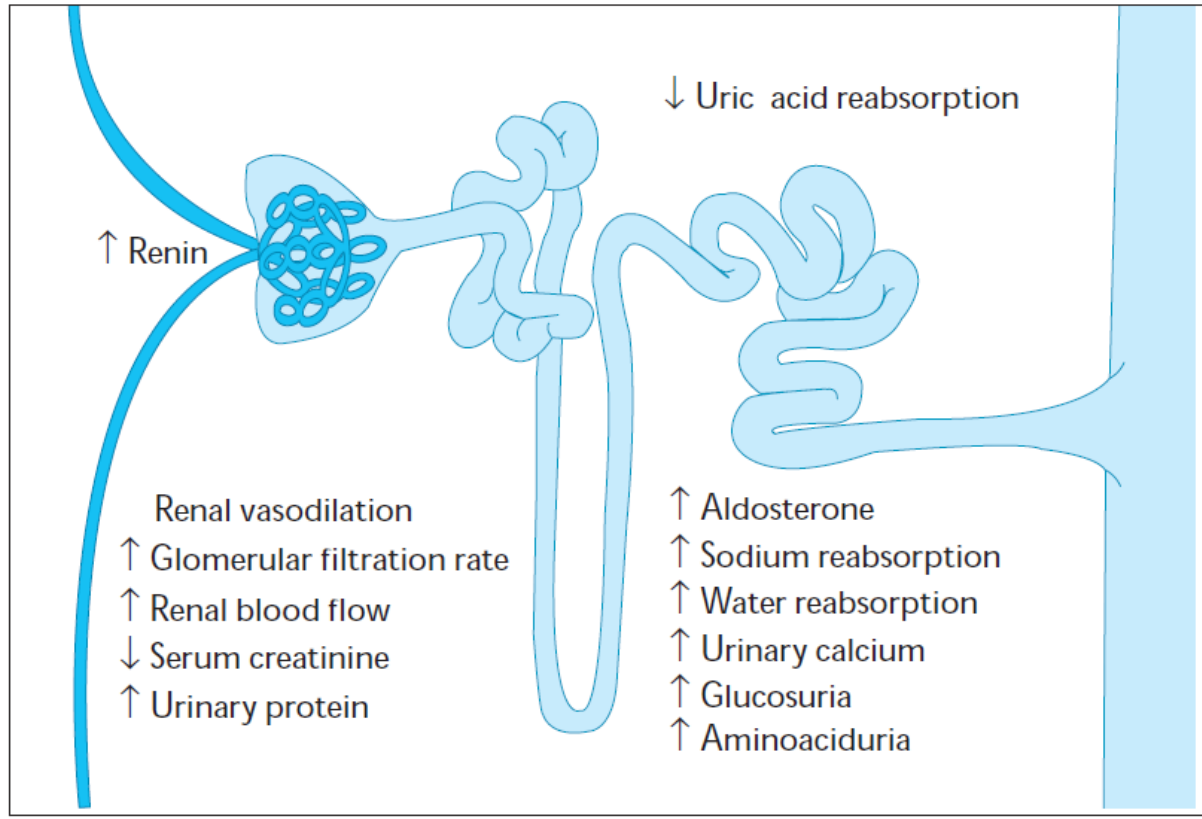
### Endocrine function

- ↑ Renin
- ↑ Erythropoietin
- ↑ Active vitamin D



- ↑ Pelvicalyceal dimensions (right > left)

# Changes in renal function during pregnancy



# Effect of kidney disease on pregnancy

Degree of kidney failure determines pregnancy outcome

Absence of hypertension decreases the risk of poor outcome

ACEI/ARBs are contraindicated during pregnancy, enalapril can be used safely while breastfeeding

# Effect of pregnancy on kidney disease

Increase of proteinuria

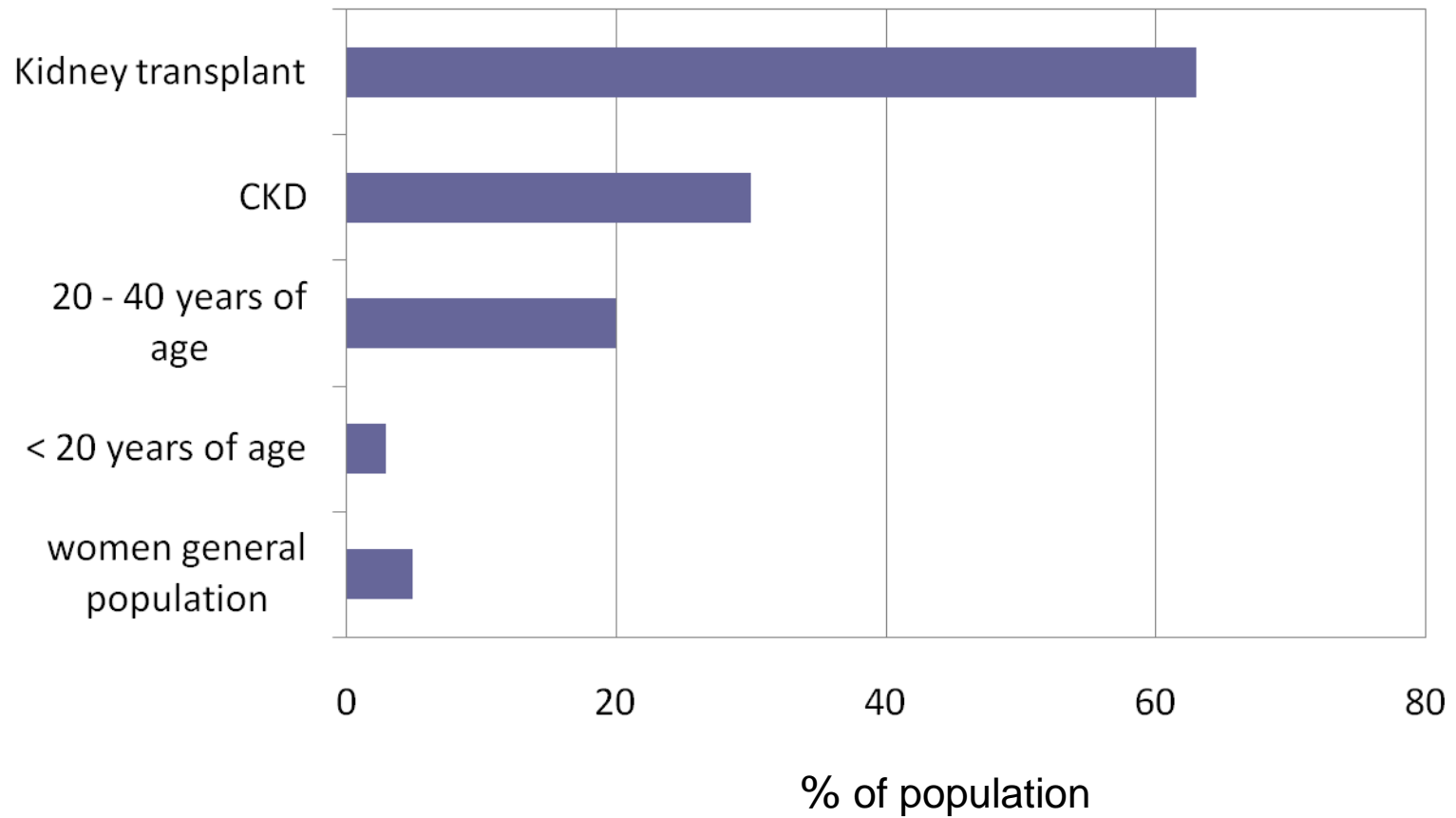
Worsening of hypertension

Increased risk of preeclampsia

Anaemia

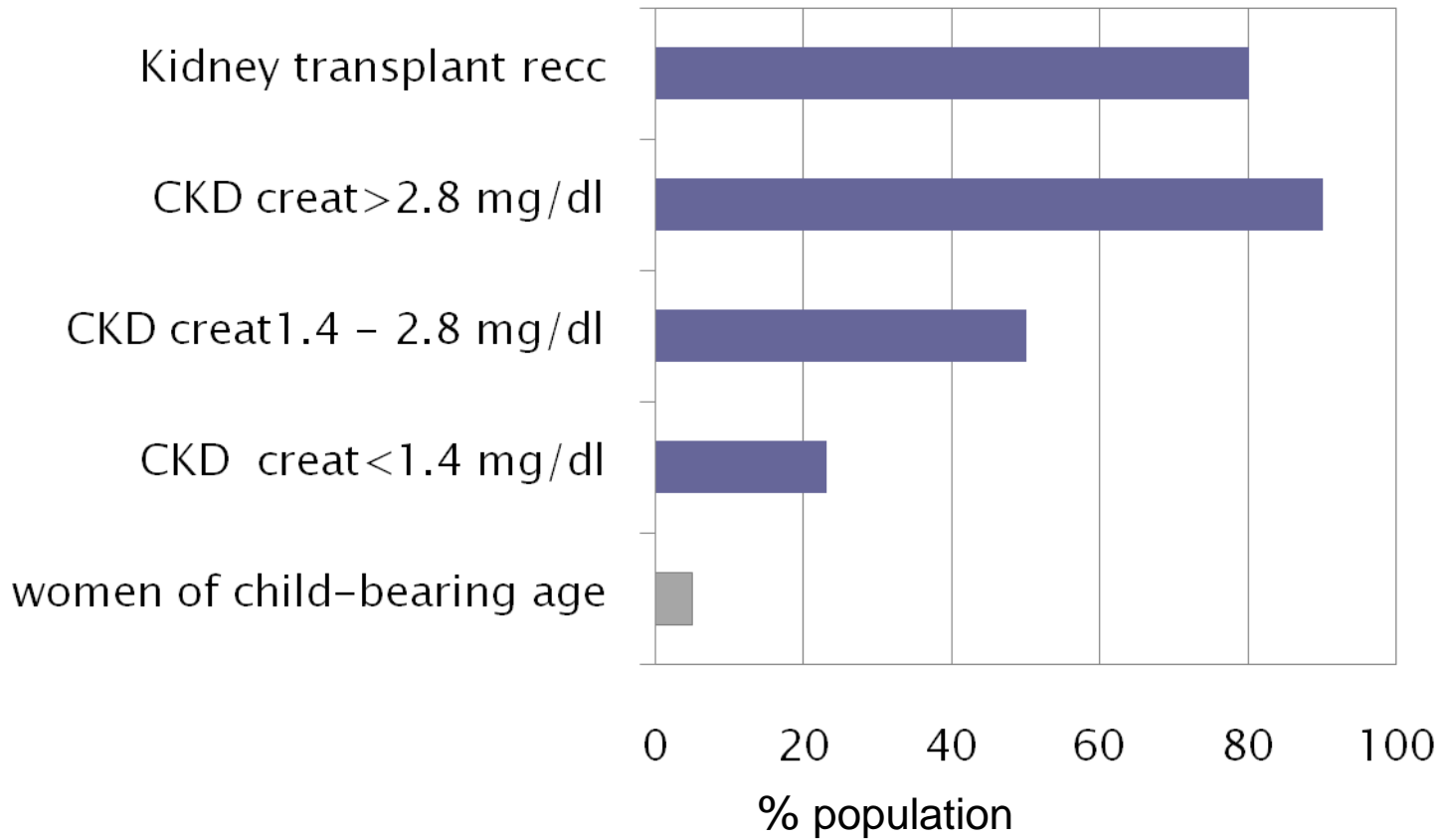
Worsening of renal function temporary or  
permanent

# The prevalence of hypertension in women of child-bearing age





# Incidence of pregnancy induced hypertension in CKD-affected women



# The key questions regarding pregnancy hypertension differential diagnostics

## **Chronic hypertension before pregnancy**

usually diagnosed < 20 weeks of pregnancy

## **Pregnancy induced hypertension**

### **Prereclampsia**

systolic >140 mm Hg

diastolic >90 mm Hg

proteinuria >300 mg/24h

diagnosed > 20 week of pregnancy



# Clinical features of preeclampsia

## *Medical History*

Nulliparity

Multiple gestations

Family history

Preexisting renal or vascular disease

## *Clinical presentation*

Hypertension:

140/90 mm Hg > 20 wk or

30 mm Hg increase in syst BP

15 mm Hg increase in diast BP

Sudden appearance of edema

Rapid weight gain

Headache, visual disturbances

Abdominal or chest pain

# Fetal consequences of maternal hypertension

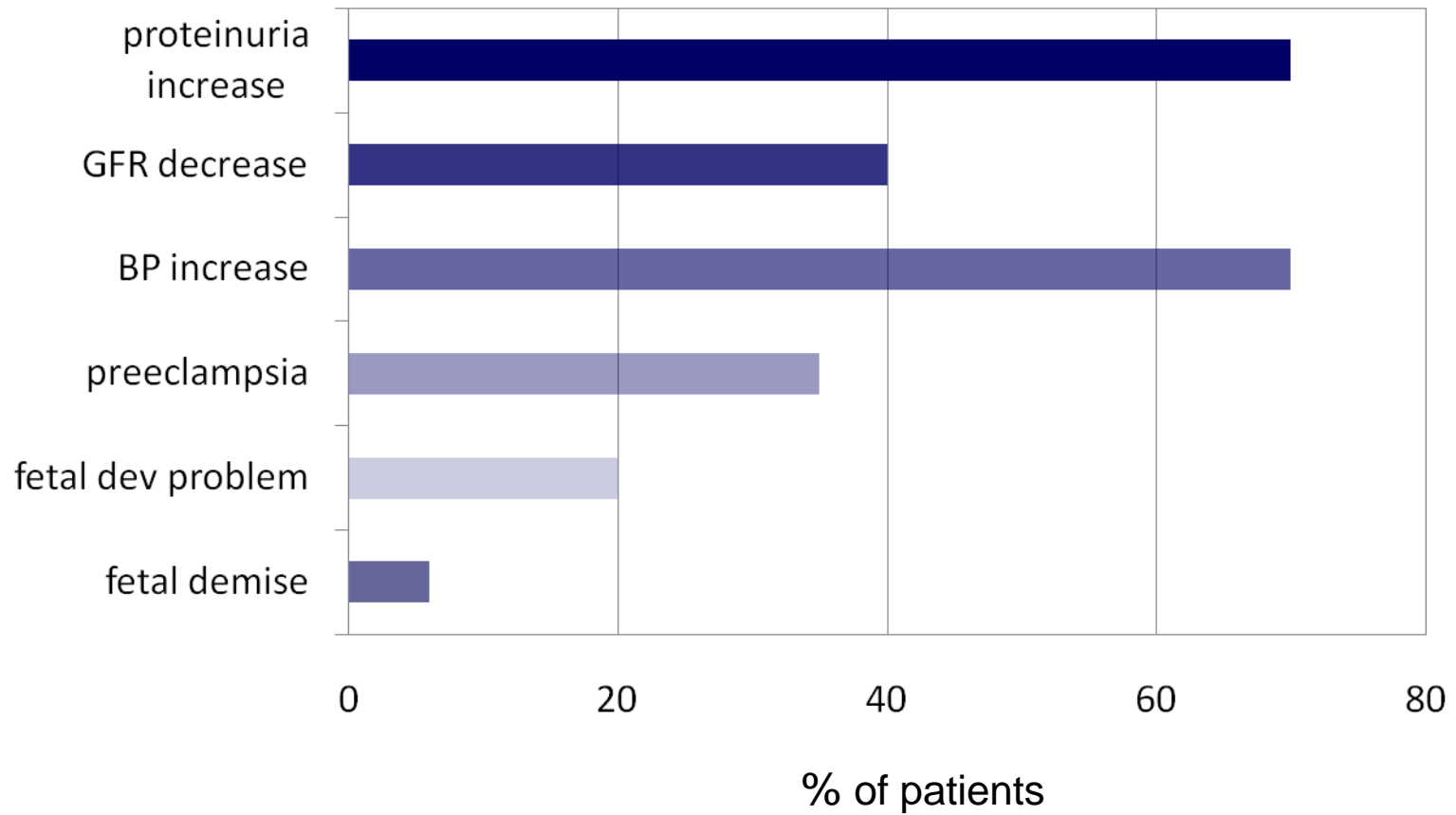
3- to 6-fold increase in stillbirths

5- to 15-fold increase in intrauterine growth  
restriction

Premature delivery

Long-term developmental and neurologic  
problems

# Pregnancy complications in overt diabetic nephropathy



# Pregnancy and Lupus Nephritis

Factors associated with poor outcome:

- ▶ Active disease at conception
- ▶ Disease first appearing during pregnancy
- ▶ Hypertension, azotemia in the first trimester
- ▶ High titers of antiphospholipid antibodies or lupus anticoagulant

# Intrinsic renal disease vs preeclampsia

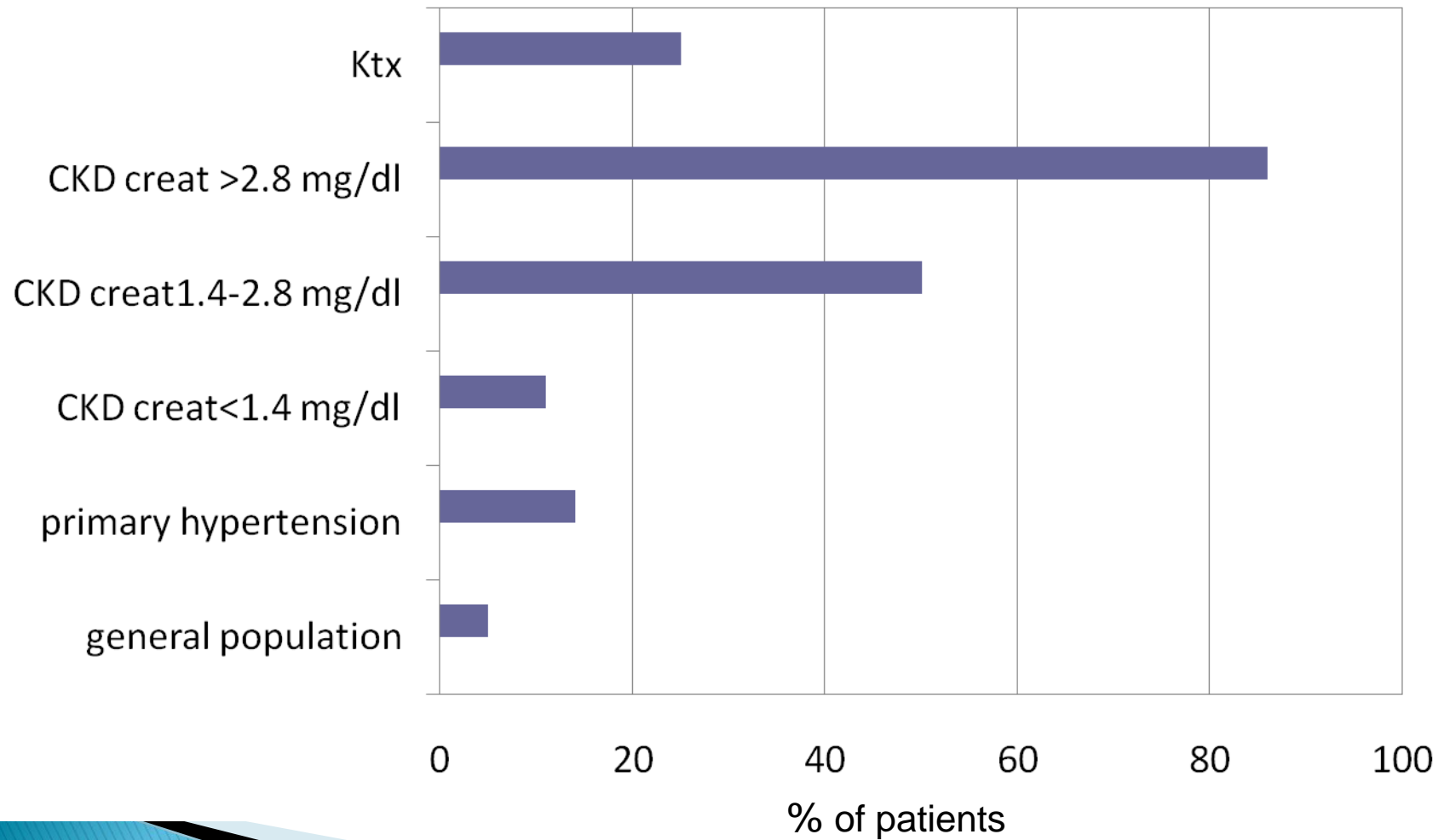
	Renal disease	PE
serum creatinine	>1 mg/dl	0.8–1.2 mg/dl
urinary protein	variable	>300 mg/d
uric acid	variable	>5.5 mg/dl
blood pressure	variable	>140/90 mm Hg
LFT	normal	may be increased
platelet count	normal	may be decreased
urinalysis	variable	Protein + L, E + or -

# Lupus flare vs preeclampsia

	SLE	PE
Proteinuria	+	+
hypertension	+	+
Erythrocyte casts	+	-
Azotemia	+	+
Low C3, C4	+	-
Abnormal liver function test	-	- / +
Low platelet count	+	- / +
Low leukocyte count	+	-



# Incidence of preeclampsia



# When to introduce antihypertensive treatment in pregnancy

Systolic BP  $>150$  mm Hg

Or diastolic  $>100$  mm Hg

whenever there is an injury/damage of vital organs:

- LV hypertrophy
- kidney injury/disease

treatment goal: ?

# Treatment goals in chronic vs pregnancy hypertension

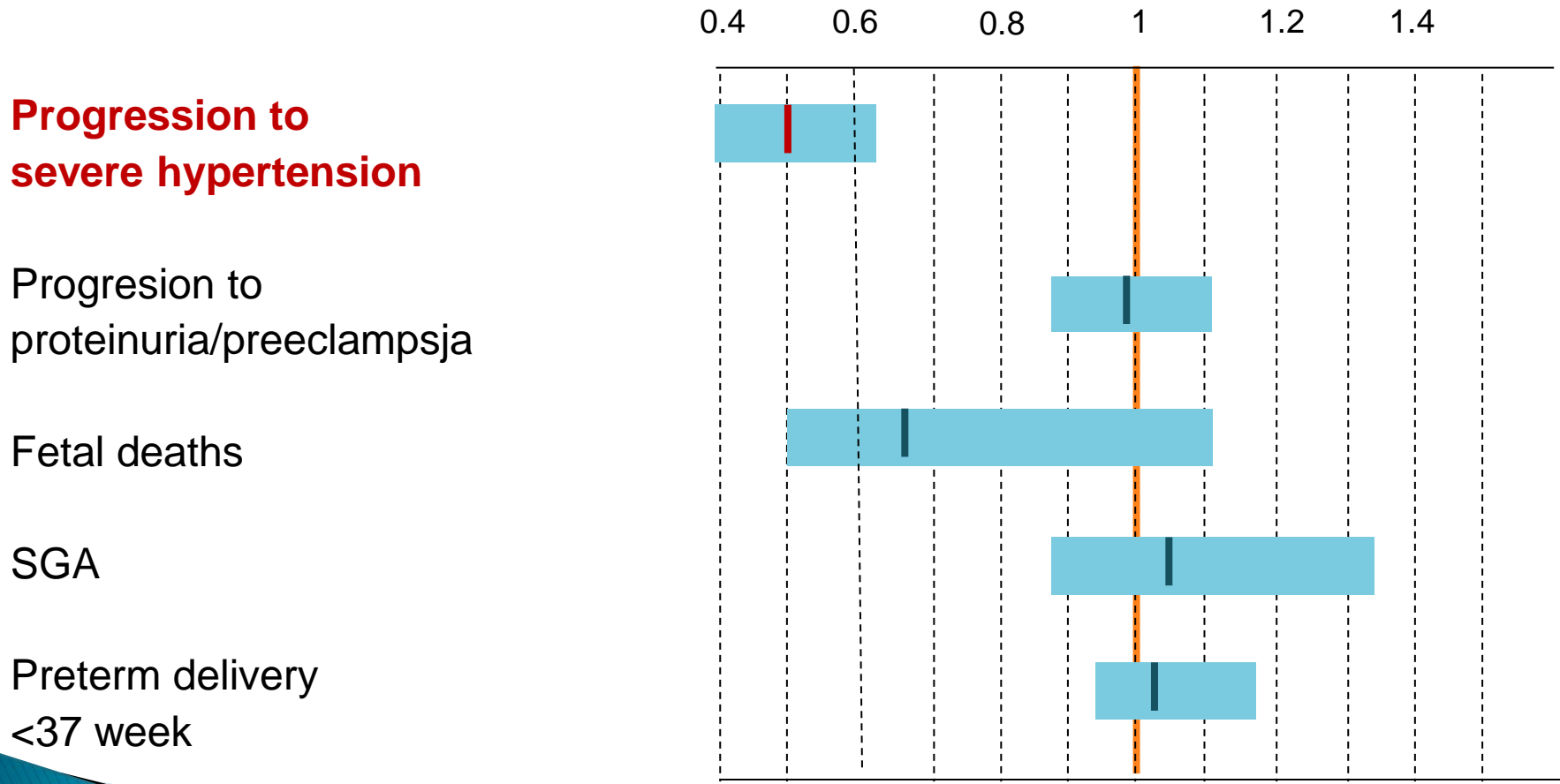
- ✓ optimal BP control
- ✓ end organ damage prophylactics
- ✓ Long-term complications prophylactics
- ✓ Life-long

- ✓ optimal placenta perfusion
- ✓ Typical organ damage prophylactics
- ✓ 9 months

Chronic hypertension

Pregnancy hypertension

# Effects of antihypertensive treatment of with /moderate hypertension during pregnancy



# Acute renal failure in pregnancy

Acute tubular necrosis; hemodynamic factors,  
toxins

serious infection

acute interstitial nephritis

acute fatty liver of pregnancy

preeclampsia–HELLP syndrome

microangiopathic syndromes

acute cortical necrosis: obstetric hemorrhage

# Fertility in Women in ESRD

Successful outcome 20–30%

High incidence of prematurity

Outcome related to residual maternal renal function

Management:      Increased hours on dialysis  
                         Erythropoietin therapy  
                         Blood pressure control  
                         low doses of heparin

peritoneal dialysis      vs      hemodialysis ?



# CKD and pregnancy risk stratification

Creatinine  
<1.4 mg/dl

Preserved, mildly reduced kidney function

Good outcome

Increased BP 23%, preeclampsia 11%

Proteinuria 50%, permanent GFR loss 6%

Creatinine  
1.4 - 2.8 mg/dl

Moderately impaired renal function

Preeclampsia 50%, CKD progression 20%

Creatinine  
>2.8 mg/dl

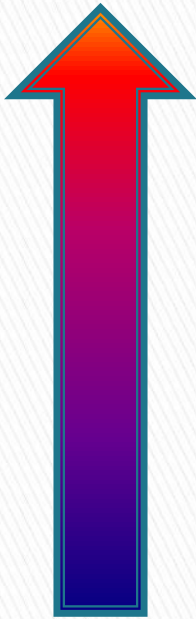
Severe renal insufficiency

High maternal/fetal morbidity

preeclampsia 86%, CKD progression > 50%

# Pregnancy outcome by kidney disease

Risk of complication



periarteritis nodosa  
scleroderma  
FSGS  
MCGN  
LN  
MN  
chronic interstitial  
nephritis  
IgA nephropathy

# Antihypertensive treatment in pregnancy

medication	FDA category
<b>methyldopa</b>	<b>B</b>
labetalol	C
nifedypine	C
hydralazine	C
Beta blocker	C
hydrochlorothiazide	C
<b>ACEI/ARA</b>	<b>D</b>
diazoxide	C
sodium nitroprusside	C!

medication	FDA	comment
<b>methyldopa</b>	<b>B</b>	Long experience, no impact of fetal development
labetalol	C	effective, well tolerated, doesn't diminish placenta blood flow
nifedypine	C	Safe and effective as methyldopa, may diminish uterus contractions
hydralazine	C	Tachycardia, fluid retention, withdrawn from the market
Beta blocker	C	Fetal bradycardia, atenolol – high IUGR risk
hydrochlorothiazide	C	Use only in case of fluid retention, risk of metabolic abnormalities
<b>ACEI/ARA</b>	<b>D</b>	<b>7-9 - 22% risk of malformations</b>

# Management of Chronic Kidney Disease during pregnancy

preconception counseling

multidisciplinary approach

frequent monitoring of

- blood pressure (every 1–2 wk)
- renal function (every mo)
- monitor for signs of preeclampsia

balanced diet (moderate sodium, protein)

maintain BP at 120–140/80–90 mm Hg



## Renal disease in pregnancy

*“What advice should we give to a woman with chronic renal disease who is contemplating pregnancy?....dogmatic prohibition does not seem justified today.... Instead, obstetricians and physicians must batten down the hatches and prepare to ride out the storm together with those determined to set sail.”*

*Lancet ii, 1975, 801-2*