



UNIUNEA EUROPEANĂ



GUVERNUL ROMÂNIEI



Fondul Social European  
POSDRU 2007-2013



Instrumente Structurale  
2007-2013



GUVERNUL ROMÂNIEI  
MINISTERUL MUNCII, FAMILIEI,  
PROTECȚIEI SOCIALE  
ȘI PERSOANELOR VÂRSTNICE  
OIRPOSDRU REGIUNEA CENTRU



UNIVERSITATEA DE MEDICINĂ ȘI  
FARMACIE "CAROL DAVILA"  
BUCUREȘTI

## AD-COR Program inovativ de formare in domeniul cardiologiei pediatrice POSDRU/179/3.2/S/152012

*Noiembrie 2015*

MODUL TEORETIC

# Hipertensiunea arteriala la copil (1)

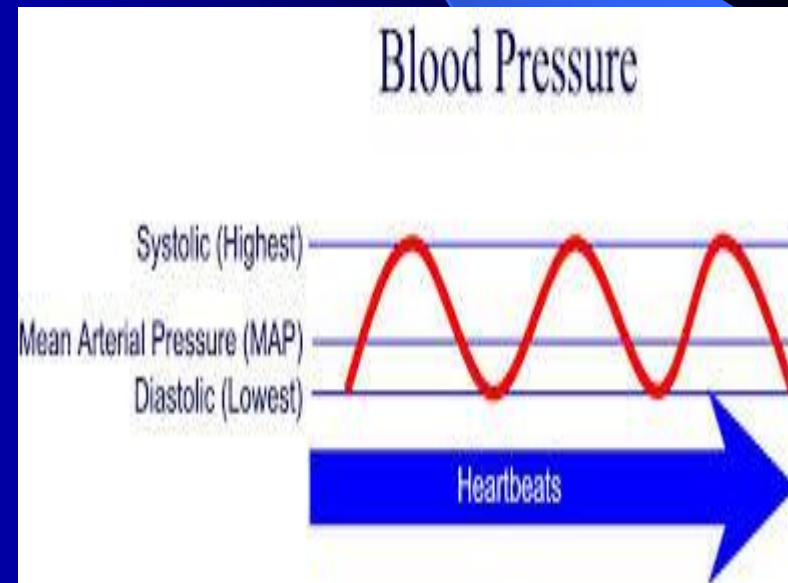
Continut documentat/ validat/ prezentat de:

⇒ Expert formare asistente: FILIP Cristina

*A5 - Planificarea, organizarea si desfasurarea activitatilor de formare a asistentelor medicale in domeniul cardiologiei pediatrice*

# Tensiunea arteriala

- Definitie = forta exercitata de sange asupra peretilor arteriali
- TA sistolica
- TA diastolica
- $TA\ medie = (TAs + 2TAd) / 3$



# Tehnica masurarii TA

- Metoda manuala (cu manometru/cu mercur)
  - auscultatorie (stetoscop)
  - palpatorie (puls la brahiala/radiala)
- **Metoda automata (device-uri)**

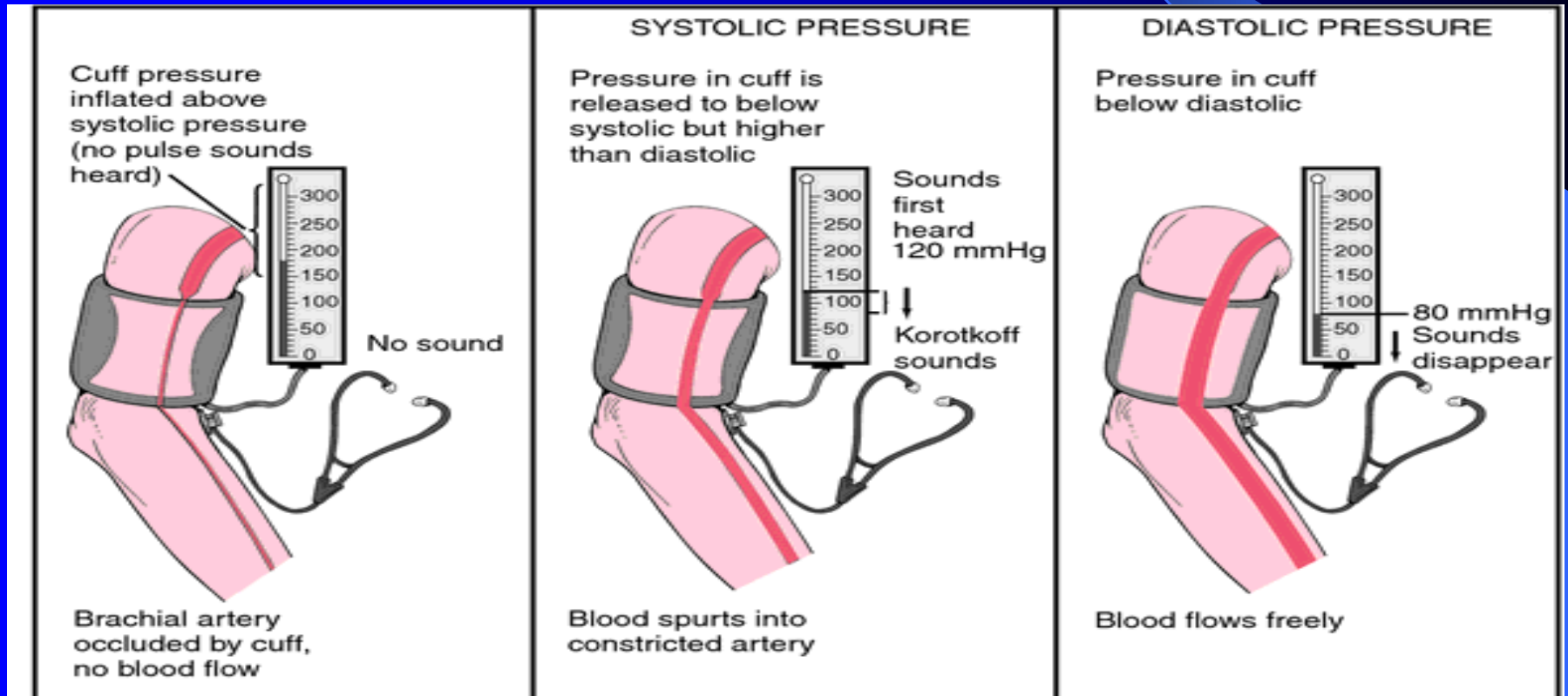
# Tehnica uzuala de masurare a TA

- Cu copilul linistit, in pozitie culcat sau sezand
- Cu bratul masuratorii in planul inimii
- Se umfla manseta cu 20 mm Hg peste valoarea estimata a Tas



# Masurarea tensiunii arteriale la copil

- Masurarea de rutina a TA la consultul pediatric trebuie sa inceapa la varsta de 3 ani



# Situatii care impun masurarea TA la copii < 3 ani (1)

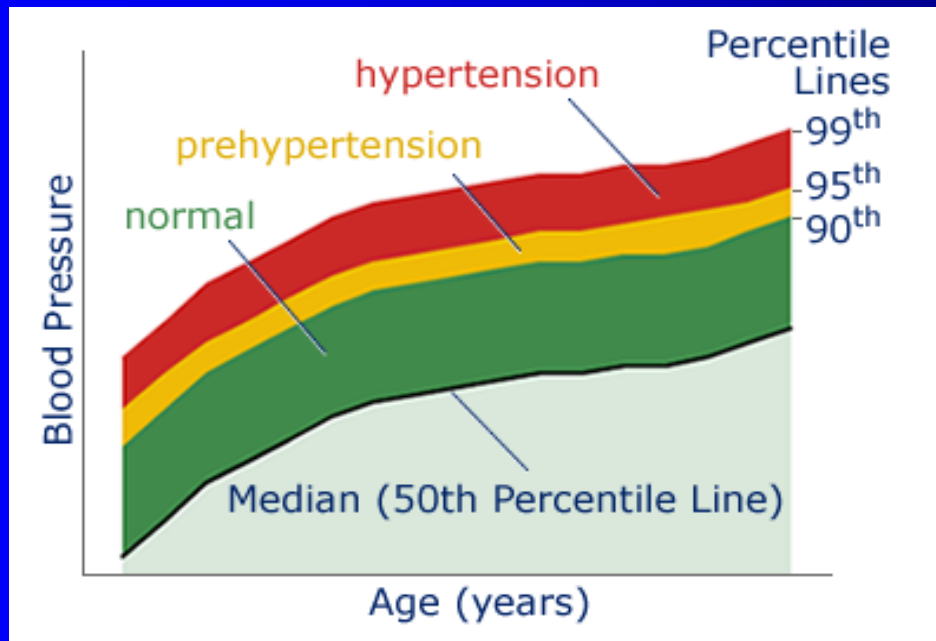
- Istoric de prematuritate, prematur cu greutate foarte mica, alte complicatii ce au necesitat masuri de terapie intensiva neonatala
- Malformatii congenitale de cord
- ITU recurente
- Boli renale cunoscute sau malformatii urologice

# Situatii care impun masurarea TA la copii < 3 ani (2)

- Transplant de organ
- Malignitati sau transplant de maduva
- Tratament cu medicamente care dau HTA ca reactie adversa
- Alte patologii asociate cu HTA
- Dovezi de presiune intracraniana crescuta

# Definitia HTA la copil

- Valoarea TA > percentila 95%, ajustata pentru varsta, greutate si sex



# Definitions

**TABLE 3. BP Levels for Boys by Age and Height Percentile**

Age, y	BP Percentile	SBP, mm Hg							DBP, mm Hg						
		Percentile of Height							Percentile of Height						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
1	50th	80	81	83	85	87	88	89	34	35	36	37	38	39	39
	90th	94	95	97	99	100	102	103	49	50	51	52	53	53	54
	95th	98	99	101	103	104	106	106	54	54	55	56	57	58	58
	99th	105	106	108	110	112	113	114	61	62	63	64	65	66	66
2	50th	84	85	87	88	90	92	92	39	40	41	42	43	44	44
	90th	97	99	100	102	104	105	106	54	55	56	57	58	58	59
	95th	101	102	104	106	108	109	110	59	59	60	61	62	63	63
	99th	109	110	111	113	115	117	117	66	67	68	69	70	71	71
3	50th	86	87	89	91	93	94	95	44	44	45	46	47	48	48
	90th	100	101	103	105	107	108	109	59	59	60	61	62	63	63
	95th	104	105	107	109	110	112	113	63	63	64	65	66	67	67
	99th	111	112	114	116	118	119	120	71	71	72	73	74	75	75
4	50th	88	89	91	93	95	96	97	47	48	49	50	51	51	52
	90th	102	103	105	107	109	110	111	62	63	64	65	66	66	67
	95th	106	107	109	111	112	114	115	66	67	68	69	70	71	71
	99th	113	114	116	118	120	121	122	74	75	76	77	78	78	79
5	50th	90	91	93	95	96	98	98	50	51	52	53	54	55	55
	90th	104	105	106	108	110	111	112	65	66	67	68	69	69	70
	95th	108	109	110	112	114	115	116	69	70	71	72	73	74	74
	99th	115	116	118	120	121	123	123	77	78	79	80	81	81	82
6	50th	91	92	94	96	98	99	100	53	53	54	55	56	57	57
	90th	105	106	108	110	111	113	113	68	68	69	70	71	72	72
	95th	109	110	112	114	115	117	117	72	72	73	74	75	76	76
	99th	116	117	119	121	123	124	125	80	80	81	82	83	84	84

# Cum se calculeaza percentila 95 pentru TA la copil

- Tensiunea arteriala sistolica (1-17 ani)  
=  $100 + (\text{varsta in ani} \times 2)$
- Tensiunea arteriala diastolica (1-10ani)  
=  $60 + (\text{varsta in ani} \times 2)$
- Tensiunea diastolica (11-17 ani)
- =  $70 + (\text{varsta in ani})$

# DE retinut!!

- TA se masoara corect la toate cele 4 membre
- Manseta nu trebuie montata:
  - prea strans ( $--\rightarrow$  TA mai mica decat cea reala)
  - prea larga ( $-\rightarrow$  TA mai mare decat cea reala)

# Clasificarea HTA la copii

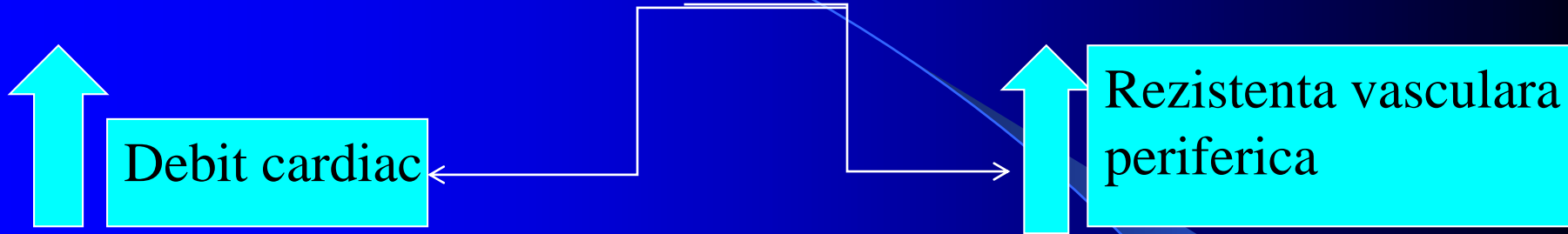
<b>Normal</b>	<b>Tas/Tad &lt; percentila 90%</b>
<b>PreHTA</b>	<b>Percentila 90-94% sau TA &gt; 120/80 mm Hg chiar daca este sub percentila 90</b>
<b>HTA st.1</b>	<b>Percentila 95-99% + 5 mm Hg</b>
<b>HTA st.2</b>	<b>&gt;Percentila 99% + 5 mm Hg</b>



# HTA la copil

- HTA secundara – majoritatea cazurilor de HTA la copilul  $< 10$  ani
- HTA primitiva – f.rara la copilul  $< 10$  ani
  - incidenta crescuta la adolescenti (frecvent asociata obezitatii)

# Mecanisme/cauze HTA



- *Hipervolemia*

Stenoza artera renala

Boli renale

Hiperaldosteronism

Hipersecretie de ADH

Coarctatie de aorta

Sarcina (preeclampsie)

- *Stress*

Activare simpatica

- *Feocromocitom*

Catecolamine crescute

- *Stress*

- Activare simpatica

- *Stenoza artera renala*

- Crestere

Angiotensinogen II

- *Feocromocitom*

- Crestere catecolamine

- *Disfunctii tiroidiene*

- *Diabet*

- *Ischemie cerebrala*



Age

Children

Adults

Secondary causes

Renal causes (78%)

Reno-vascular causes (12%)

Coarctation Aorta (2%)

Other causes (endocrine causes, phaeo) (8%)

*(Essential HTN)*

Essential HTN

*(Secondary causes)*

Frequency

# HTA secundaria

Infants	Children		Adolescents
	1-6 y	7-12 y	
<b>Thrombosis of renal artery or vein</b>	<b>Renal artery stenosis</b>	<b>Renal parenchymal disease</b>	<b>Essential hypertension</b>
<b>Congenital renal anomalies</b>	<b>Renal parenchymal disease</b>	<b>Renovascular abnormalities</b>	
<b>Coarctation of aorta</b>	<b>Wilms tumor</b>	<b>Endocrine causes</b>	<b>Renal parenchymal disease</b>
<b>Bronchopulmonary dysplasia</b>	<b>Neuroblastoma</b>	<b>Essential hypertension</b>	<b>Endocrine causes</b>
	<b>Coarctation of aorta</b>		

# Crizele hipertensive (1)

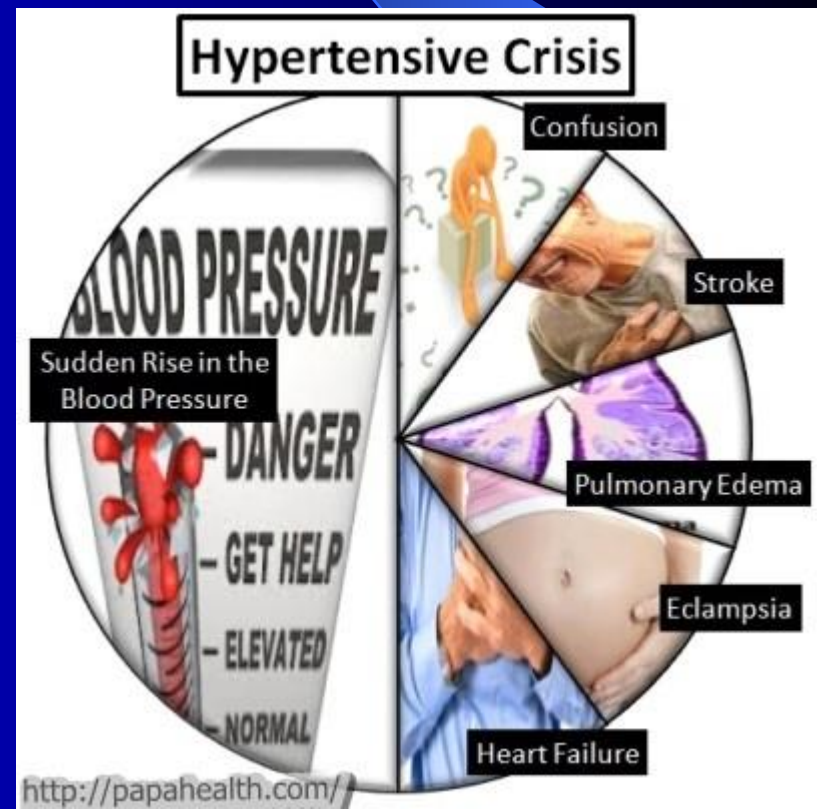
- *Urgenta hipertensiva*

- crestere semnificativa a TA fara afectarea organelor tinta

- simptome: dureri de cap, tulburari de vedere, greata

# Crizele hipertensive (2)

- Urgenta hipertensiva majora
  - crestere importanta a TAs si TAd (de obicei Tas > 180 mm Hg si TAd > 120 mm Hg)
  - afectarea organelor tinta
- AVC ischemic/hemoragic
- edem pulmonar
- insuficienta renala
- encefalopatie hipertensiva
- convulsii



# Manifestari clinice corelate cu HTA

- De obicei asimptomatici
- Simptomatologia bolii de fond (in cazul HTA secundare)
- Relativ frecvent obezitate (mai ales in caz de HTA primitiva)
- Salt tensional: cefalee, vertij, tulburari vizuale
- Encefalopatie hipertensiva: vomă, cresterea temperaturii, alterarea senzoriului, convulsii

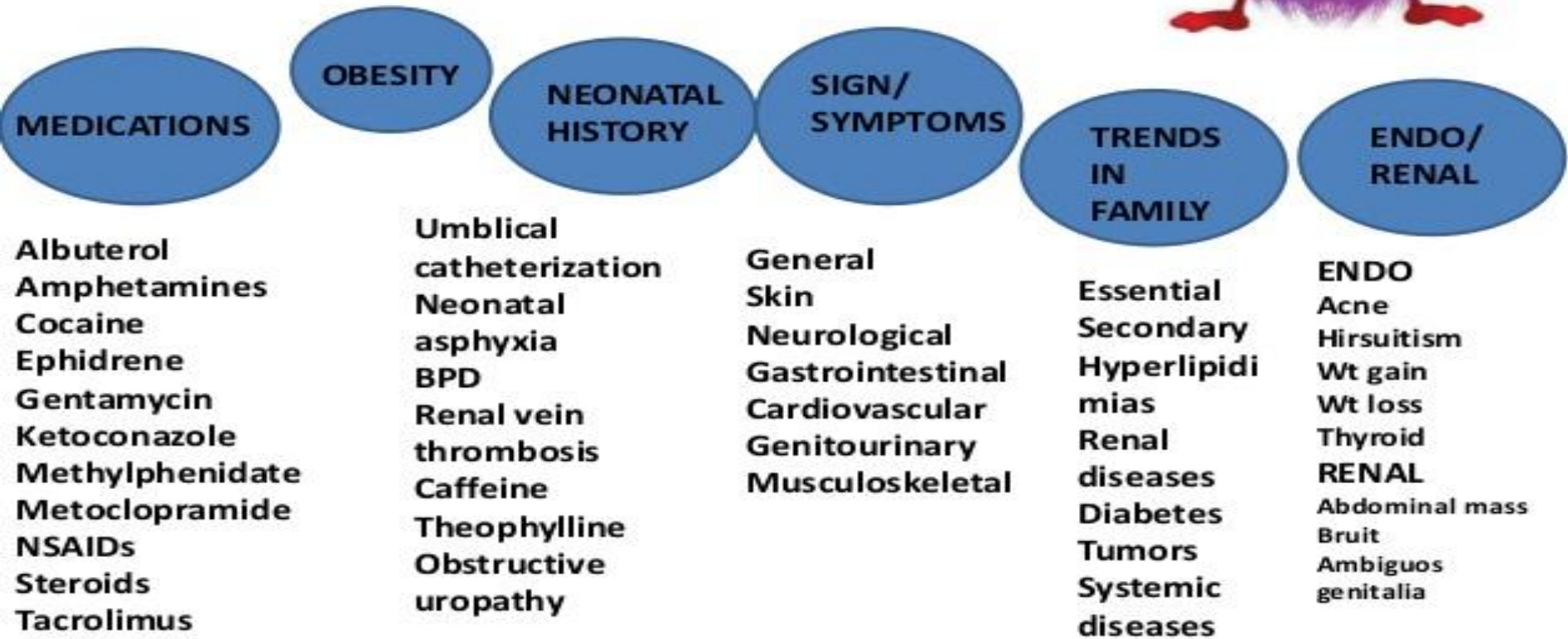
# CAUSES OF HYPERTENSION IN PEDIATRIC POPULATION

Renal Causes	Renal Parenchymal diseases (78%)
	Renal vascular diseases (12%)
Cardiovascular	CoA(2%)
	Condition with large stroke volume (PDA, AV fistula)
Endocrine	Hyperthyroidism
	Excessive Catecholamine levels (Pheochromocytoma)
	Adrenal dysfunction (CAH 11b, 17 a hydroxylase deficiency)
	Hyperaldosteronism (Conn's Syndrome, Renin Producing Tumors)
	Hyperparathyroidism
Neurogenic	Raised ICT, Poliomyelitis, GBS, encephalitis
Drugs and Chemical	Sympathomimetic drugs , Amphetamines, Steroids, OCP, Heavy metal poisoning (Hg, Lead), Cocaine, Cyclosporine
Miscellaneous	Hypercalcemia, After Coarctation repair, fractures of long bone, Pre eclampsia etc.

# HTA

- anamneza+clinica -

## MONSTER



# HTA secundara medicatiei

- Cortizon/derivati de cortizon (administrare sistemica dar si topica in doze mari!)
- AINS
- Gentamicina
- Metoclopramid
- Fentanyl
- Contraceptive orale
- Amfetamine
- Antidepresive

# Obezitatea



- 9-13% din copiii supraponderali au HTA
- 30% din copiii obezi au HTA (IMC > percentila 95)



## COMPLICATIONS OF CHILDHOOD OBESITY

HYPERTENSION  
DYSLIPIDEMIA



TYPE II DIABETES  
EARLY PUBERTY



SLEEP APNOEA  
ASTHMA



DEPRESSION

*Hypertension-High Blood pressure*

*Dyslipidaemia-Abnormal amounts of cholesterol and/or fat in the blood*

*Sleep Apnoea-pauses in breathing or occurrences of shallow breathing during sleep*

# Istoric neonatal

- Cateterizare vena ombilicala
- Asfixie perinatala
- Displazie bronho-pulmonara
- Medicamente administrate in perioada neonatala
- Boli renale obstructive sau parenchimotoase
- Tromboza de vena renala
- Abuzul matern de substante (cocaina, heroina)

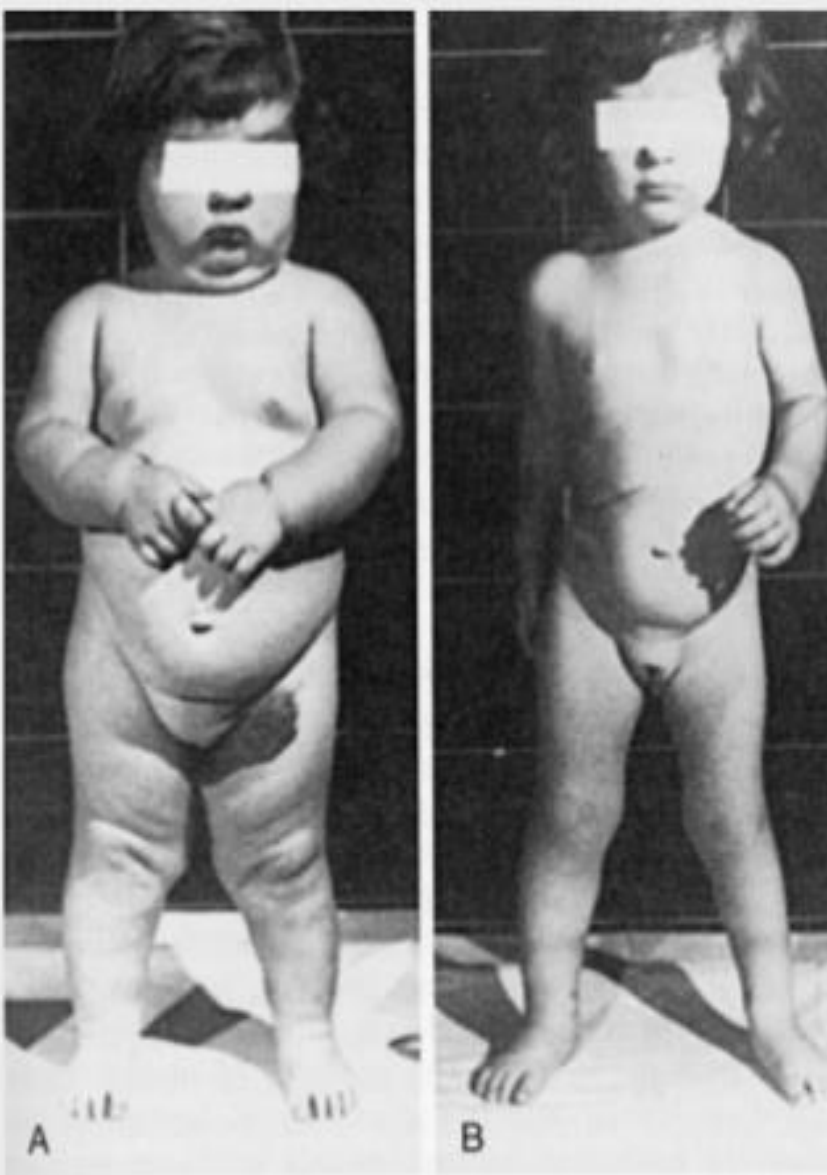
# Simptomatologie legata de boala de fond- exemple-

- Claudicatie, dispnee de efort – coarctatie de aorta
- Disurie – boli renale parenchimotoase
- Urina spumoasa – sdr.nefrotic
- Hematurie – glomerulonefrita
- Scadere in greutate, transpiratii, agitatie – hipertiroidie
- Exces ponderal, statura mica, astenie, tulburari psihice, facies caracteristic – boala Cushing

# Simptomatologie legata de boala de fond- exemple-

- Lentoare, crestere in greutate, bradilalie-hipotiroidie
- Rash malar, tumefactii articulare, febra – lupus
- Dureri de cap, varsaturi – hipertensiune intracraniana
- Durere abdominala (flanc) – tromboza vena renala
- Purpura palpabila, dureri abdominale – Purpura Henoch - Schonlein

Henoch-Schoenlein purpura



Cushing syndrome



# Semne clinice ale bolii de fond(1)

- Puls absent la membre inferioare, suflu torace posterior- Coarctatie de aorta
- Pete café-au-lait – Neurofibromatoza
- Mase abdominale palpabile- rinichi polichisti, nefroblastom, alte tumori
- Sufluri arteriale abdominale – stenoze artere renale, boala Takayasu



# Semne clinice ale bolii de fond(2)

- Facies “in luna plina” – sdr.Cushing
- Edeme generalizate – insuficienta cardiaca sau renala
- Rash malar, tumefactie articulara
- Lupus eritematos



# Boli endocrinologice cu HTA

- ***Hipertiroidie*** - tremor, anxietate, scadere in greutate, intoleranta la caldura
- ***Feocromocitom*** – transpiratii, dureri de cap, flush, pusee HTA
- ***Sindrom Cushing*** – obezitate, statura mica, hirsutism ,acnee, vergeturi, hiperpigmentare, istoric de administrare de steroizi
- ***Hiperplazie adrenală congenitală*** – ambiguitate genitală, virilizare, pubertate precoce

# Istoric familial

- HTA primitiva/secundara in familie
- Dislipidemie
- Diabet zaharat
- Preeclampsie
- Boli renale
- Tumori
- Boli sistemice

# Afectarea organelor tinta

## Main complications of persistent High blood pressure

### Brain:

- Cerebrovascular accident (strokes)
- Hypertensive encephalopathy:
  - confusion
  - headache
  - convulsion

### Blood:

- Elevated sugar levels

### Retina of eye:

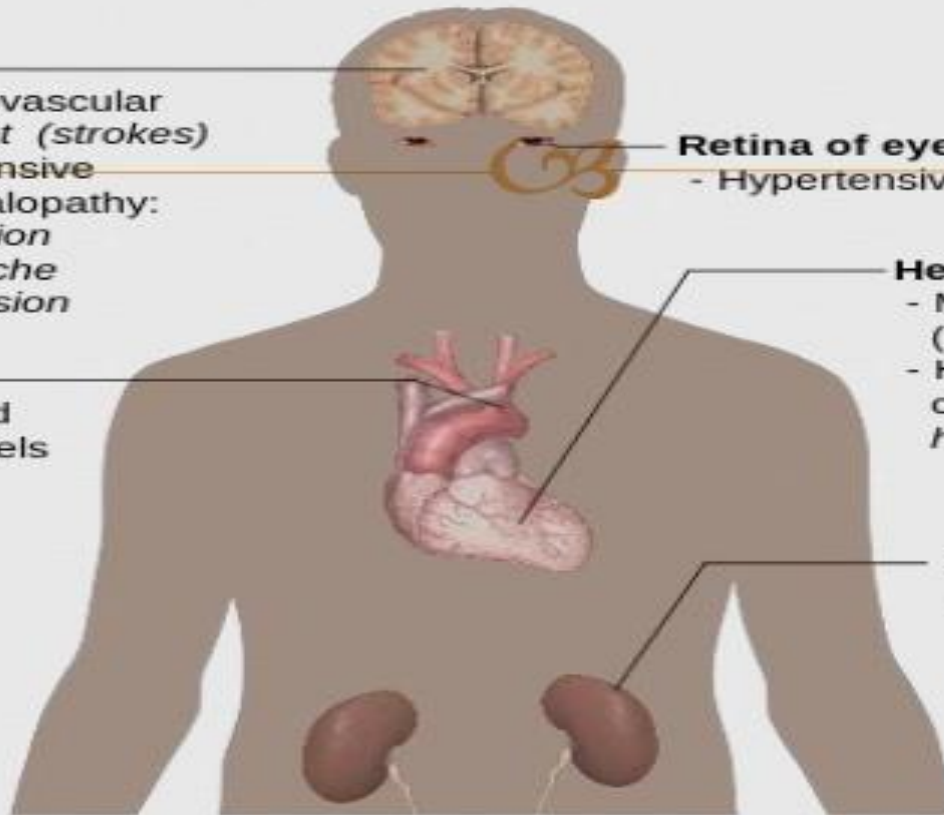
- Hypertensive retinopathy

### Heart:

- Myocardial infarction (heart attack)
- Hypertensive cardiomyopathy: *heart failure*

### Kidneys:

- Hypertensive nephropathy: *chronic renal failure*




# Investigatii privind afectarea organelor tinta

- Examen fund de ochi
- Raport albumina/creatinina urinara
- Ecocardiografia (hipetrofia VS, disfunctie diastolica VS)
- CT/RM cerebral – in cazuri selectate de HTA maligna

# Investigatii de considerat (1):

- Analize uzuale de sange si urina
- Cortizol plasmatic
- Proteinurie/24 h (glomerulonefritie, sdr.nefrotic)
- Urocultura (pielonefrite cronice)
- Ecografie cardiaca (Coarctatie de aorta)

# Investigatii de considerat (2):

- Renina plasmatica -  HTA renovasculara  
hiper-aldoestonism
- Screening toxicologic
- Catecolamine serice si urinare (feocromocitom)
- Hormoni tiroidieni

# Investigatii de considerat (3):

- Aldosteron seric
- Ecografie abdominala (malformatii /tumori renale, asimetrie renala, neuroblastoame, tumori suprarenale, pielonefrite, glomerulonefrite etc )
- Doppler artere renale
- CT cerebral

# Concluzii (1)

- Masurarea TA la copil trebuie efectuata cel tarziu la varsta de 3 ani, dar obligatoriu mai devreme la cei cu factori de risc pentru dezvoltarea HTA
- Marea majoritate a copiilor cu HTA sunt asimptomatici pana cand TA devine semnificativ crescuta cu afectare potentiala a organelor tinta



Yes!!

The course is over!!



**END OF LECTURE**