A Practical Approach to Hypertension Management

Edward Barnes, MD, FACP
Associate Dean - Academic Innovation
Chief, Division of Nephrology and Hypertension
College of Osteopathic Medicine of the Pacific
Western University of Health Sciences
Outline
Essential Hypertension is Polygenic

**Blood vessel**

*Functional:*
- ↓ Nitric oxide secretion
- ↑ Endothelin production
- Ca²⁺ or Na⁺/K⁺ channel defects
- Hyperresponsiveness to catecholamines

*Structural:*
- Exaggerated medial hypertrophy

**CNS**
- ↑ Basal sympathetic tone
- Abnormal stress response
- Abnormal response to signals from baroreceptors and volume receptors

**Pressure/volume receptors**
- Desensitization

**Adrenal**
- Catecholamine leak or malregulation

**Kidney**
- RAA dysfunction
- Ion channel defects (e.g., Na⁺/K⁺/2Cl⁻ cotransporter, basolateral Na⁺/K⁺ ATPase, Ca²⁺ ATPase)
Epidemiology

- HTN prevalence ~ 50 million people in the United States
- The BP relationship to risk of CVD is continuous, consistent, and independent of other risk factors
- For persons over age 50, SBP is a more important than DBP as CVD risk factor
- Persons who are normotensive at age 55 have a 90% lifetime risk for developing HTN
- Each increment of 20/10 mmHg doubles the risk of CVD across the entire BP range starting from 115/75 mmHg
- Elevated Blood Pressures signal the need for increased education to reduce BP in order to prevent hypertension

JNC 7, JAMA May 21, 2003,
High Blood Pressure: Lifetime Risk* Starting at Age 55-65 Years

Framingham Heart Study

*Risk of Hypertension (%)

*Residual lifetime risk of developing hypertension among people with blood pressure ≤140/90 mmHg

High Blood Pressure*: Prevalence in U.S. Adults

National Health and Nutrition Examination Survey (NHANES)

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>25</td>
<td>20</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Non-Hispanic Black</td>
<td>30</td>
<td>25</td>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>25</td>
<td>20</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Mexican-American</td>
<td>25</td>
<td>20</td>
<td>20</td>
<td>15</td>
</tr>
</tbody>
</table>

F=Female, M=Male

*High blood pressure defined as blood pressure \( \geq 140/90 \) mmHg or treatment

The treatment of hypertension should begin with the correct measurement of blood pressure.
How do we properly diagnose Hypertension?

- Average of 2 or more seated blood pressure readings
- During each of 2 or more outpatient visits
- Verify in the contralateral arm
Blood Pressure Classification

<table>
<thead>
<tr>
<th>SYSTOLIC Blood Pressure</th>
<th>DIASTOLIC Blood Pressure</th>
<th>LOW</th>
<th>NORMAL</th>
<th>ELEVATED</th>
<th>HIGH Stage I Hypertension</th>
<th>HIGH Stage II Hypertension</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-100</td>
<td>100-119</td>
<td>120-139</td>
<td>140-159</td>
<td>≥ 160</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-60</td>
<td>60-79</td>
<td>80-89</td>
<td>90-99</td>
<td>≥ 100</td>
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<td></td>
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</tbody>
</table>

EXPECT New Classification Criteria

★
# JNC VII Guidelines: Measurement of Blood Pressure

<table>
<thead>
<tr>
<th>Method</th>
<th>Brief Description</th>
</tr>
</thead>
</table>
| In-office               | Two readings, 5 minutes apart, sitting in chair  
Confirm elevated reading in contralateral arm  

Ambulatory BP monitoring

Indicated for evaluation of “white-coat” HTN. Absence of 10–20% BP decrease during sleep indicates increased CVD risk

Self-measurement

Provides information on response to Rx. May help improve adherence to Rx and evaluate “white-coat” HTN

BP=Blood pressure, CVD=Cardiovascular disease,  
HTN=Hypertension, Rx=Treatment

Source: Chobanian AV et al. *JAMA* 2003;289:2560-2572
Home BP Measurement (HBPM)

- When can we use HBPM?
  - Response to antihypertensive therapy
  - Improving adherence with therapy
  - Evaluating resistant and white-coat HTN
Table I. Prospective Studies Relating Home BP and Office BP to CV Events and Mortality

<table>
<thead>
<tr>
<th>Study</th>
<th>Population Studied</th>
<th>No. of Subjects</th>
<th>Home BP Schedule</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ohasama²</td>
<td>Population</td>
<td>1789</td>
<td>28 AM 0</td>
<td>Strokes and mortality predicted better by HBPM</td>
</tr>
<tr>
<td>SHEAF³</td>
<td>Treated hypertensive patients</td>
<td>4939</td>
<td>4 AM 3 PM</td>
<td>CV morbidity and mortality predicted better by HBPM</td>
</tr>
<tr>
<td>PAMELA⁴</td>
<td>Population</td>
<td>2051</td>
<td>1 AM 1 PM 1 PM</td>
<td>CV and total mortality predicted better by HBPM</td>
</tr>
<tr>
<td>Belgian⁵</td>
<td>Referred</td>
<td>391</td>
<td>1 AM 3 PM</td>
<td>Combined CV events predicted better by HBPM</td>
</tr>
<tr>
<td>Didima⁶</td>
<td>Population</td>
<td>662</td>
<td>3 AM 2 PM 2 PM</td>
<td>CV events predicted by both HBPM and office BP</td>
</tr>
</tbody>
</table>

Abbreviations: BP, blood pressure; CV, cardiovascular; HBPM, home blood pressure monitoring; PAMELA, Pressioni Arteriose Monitorate E Loro Associazioni; SHEAF, Self-Measurement of Blood Pressure at Home in the Elderly: Assessment and Follow-up.
HBPM Use, Better Control?

- 1350 HTN patients
- 897 regularly using HBPM
- HBPM use associated with Better control
- HBPM use might be associated with possible improved medication adherence

Cuspidi, C. et al., J Hum HTN, 2004

P-value < 0.01
HBPM Guide

• Guide:
  • Rest 5 minutes
  • Arm at heart level
  • Non-dominant arm
  • Upper arm cuff optimal
  • Calibrate monitor with office cuff
  • Educate Patient on cuff use

• Protocol:
  • Record 7-days-
Ambulatory BP Monitoring

- ABPM is warranted
- Evaluation of White-Coat HTN
- Resistant HTN
- Masked HTN
- Ambulatory BP values are usually lower than clinic readings.
- Awake, individuals with hypertension have an average BP of >135/85 mmHg and during sleep >120/75 mmHg.
- **Non-Dippers**: BP drops by 10 to 20% during the night; if not, signals possible increased risk for cardiovascular events.
Uncontrolled Hypertension

- Cerebrovascular Accident
- Retinopathy
- Vascular Disease
- Nephropathy
- Heart Disease
Effect of Antihypertensive Therapy on CV Events

Percent decrease in events vs placebo

17 randomized, placebo-controlled trials using diuretic or b-blocker (n=48,000)

All reductions are statistically significant

Drugs Induced Hypertension

Volume Retention
- NSAIDs
- Sex Hormones
- Corticosteroids

SNS Activation
- Cocaine
- Decongestants
- Caffeine

Direct Vasconstriction
- Calcineurin Inhibitors
- VEGF Inhibitors
## Lifestyle Modifications

<table>
<thead>
<tr>
<th>Modification</th>
<th>Recommendation</th>
<th>Reduction in Systolic BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Reduction</td>
<td>BMI 18-25 kg/m2</td>
<td>5-20 mmHg/10kg</td>
</tr>
<tr>
<td>DASH diet</td>
<td>Fruit, vegetables, low fat dairy. Reduced sat fats</td>
<td>8-14 mmHg</td>
</tr>
<tr>
<td>Dietary Sodium</td>
<td>&lt;100 mmol/day (2.4 g/day)</td>
<td>2-8 mmHg</td>
</tr>
<tr>
<td>Physical Activity</td>
<td>Aerobic exercise 30 min/day. 3-4 days/wk</td>
<td>4-9 mmHg</td>
</tr>
<tr>
<td>Moderate ETOH consumption</td>
<td>Limit to no more that 1-2 drinks/day. F/M</td>
<td>2-4 mmHg</td>
</tr>
</tbody>
</table>
Sodium Restriction

DASH-Sodium Trial: All participants (N = 412)

<table>
<thead>
<tr>
<th>Salt Intake</th>
<th>8 g/day 4 wks</th>
<th>6 g/day 4 wks</th>
<th>4 g/day 4 wks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomised Crossover</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic Blood Pressure (mmHg)</td>
<td>n = 204</td>
<td>n = 208</td>
<td></td>
</tr>
<tr>
<td>Diastolic Blood Pressure (mmHg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 h Urinary Sodium (mmol)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
American adult daily consumption (>3,400 mg)
Adult upper level (2,300 mg)
Adult recommended daily (1,500 mg)
Adult needed daily (180 mg)

American adult daily sodium consumption exceeds 3400 mg.
Salt & Blood Pressure


Pie charts showing salt sensitivity among African Americans, with 25% being salt-sensitive and 75% not salt-sensitive. Similarly, salt sensitivity among Caucasian Americans with 65% being salt-sensitive and 35% not salt-sensitive.
Where does the Sodium Come From?
**Figure.** Documented reasons for uncontrolled BP and manner addressed according to clinic note.

- 7% Extreme circumstances at clinic visit
- 4% Focus on TLC, per patient request
- 12% Appointment nonadherence
- 13% Medications changed
- 4% Medication nonadherence, costs
- 4% Medication change next visit, per patient request
- 4% Unable to tolerate lower BP (primarily diastolic)
- 11% Medication nonadherence
- 38% Controlled at home, brings home readings

BP, blood pressure; TLC, therapeutic lifestyle changes
Guidelines
Alphabet Soup...
• The practice of medicine is an art, not a trade; a calling, not a business; a calling in which your heart will be exercised equally with your head.
  - William Osler, MD

• And prescribing anti-hypertensive medications is where most physicians like to practice that art.
  - Edward Barnes, MD
### JNC-7 General Goals for BP Control

<table>
<thead>
<tr>
<th>Pre-existing condition</th>
<th>BP goals (mmHg)</th>
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</thead>
<tbody>
<tr>
<td>Uncomplicated Hypertension</td>
<td>&lt;140/90</td>
</tr>
<tr>
<td>Diabetes or CKD</td>
<td>&lt;130/80</td>
</tr>
<tr>
<td>Renal Disease + proteinuria &gt;1.0 gram/24 h</td>
<td>&lt;125/75</td>
</tr>
</tbody>
</table>

**Goals**

- **140/90**
- **130/80**
- **120/80**
## JNC-7 Classification and Management of BP for adults

<table>
<thead>
<tr>
<th>BP classification</th>
<th>SBP* mmHg</th>
<th>DBP* mmHg</th>
<th>Lifestyle modification</th>
<th>Initial drug therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;120 and &lt;80</td>
<td>Encourage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120–139 or 80–89</td>
<td>Yes</td>
<td>No antihypertensive drug indicated.</td>
<td>Drug(s) for compelling indications. ‡</td>
</tr>
<tr>
<td>Stage 1 Hypertension</td>
<td>140–159 or 90–99</td>
<td>Yes</td>
<td>Thiazide-type diuretics for most. May consider ACEI, ARB, BB, CCB, or combination.</td>
<td>Drug(s) for the compelling indications. ‡</td>
</tr>
<tr>
<td>Stage 2 Hypertension</td>
<td>≥160 or ≥100</td>
<td>Yes</td>
<td><strong>Two-drug combination</strong>† (usually thiazide-type diuretic and ACEI or ARB or BB or CCB).</td>
<td></td>
</tr>
</tbody>
</table>

*Treatment determined by highest BP category.

†Initial combined therapy should be used cautiously in those at risk for orthostatic hypotension.

‡Treat patients with chronic kidney disease or diabetes to BP goal of <130/80 mmHg.

*SBP: Systolic Blood Pressure  
*DBP: Diastolic Blood Pressure
If Blood Pressure >130/80 mm Hg in Diabetes or Chronic Kidney Disease with Any Level of Albuminuria

(If systolic BP < 20 mm Hg above goal) start ARB or ACE inhibitor (titrate dose upward)

If BP still not at goal (130/80 mm Hg)

(If systolic BP ≥ 20 mm Hg above goal) start with ACEI or ARB/thiazide diuretic

Recheck within 2-3 weeks

Add Long-acting thiazide diuretic

If BP still not at goal (130/80 mm Hg)

Add CCB or β-blocker (titrate dose upward)

If CCB used, add other subgroup of CCB (i.e., amlodipine-like agent if verapamil or diltiazem already being used and the converse) OR if β-blocker used, add CCB

Recheck within 4 weeks

If BP still not at goal (130/80 mm Hg)

Add vasodilator (hydralazine, minoxidil) OR refer to a clinical hypertension specialist
JNC-8 BP Goals

- All Patients
  - Diastolic: 80
  - Systolic: 90

- Ages 18-59
  - Diabetes
    - Diastolic: 140
  - CKD
    - Diastolic: 140

- Ages ≥ 60
  - Diastolic: 150
  - Maximum BP (mmHg)
Beta Blockers are **NOT** preferred anti-HTN agent in the absence of comorbid conditions (CHF, CAD)
ACE Inhibitors  ARBs  CCBs  Thiazides

Prefered

ACE Inhibitors  ARBs  CCBs  Thiazides

CKD ≤ 75

African Descent w/o CKD
Abbreviations:
A = ACE inhibitor (consider angiotensin-II receptor antagonist if ACE intolerant)
C = calcium-channel blocker
D = thiazide-type diuretic

Black patients are those of African or Caribbean descent, and not mixed-race, Asian or Chinese patients

Younger than 55 years

55 years or older or black patients of any age

Step 1

A

C or D

Step 2

A + C or A + D

Step 3

A + C + D

Add
- further diuretic therapy
  or
- alpha-blocker
  or
- beta-blocker
Consider seeking specialist advice

Step 4
ADA Recommendations: Hypertension/Blood Pressure Control

Treatment

• Pharmacological therapy for patients with diabetes and hypertension (C)
  • A regimen that includes either an ACE inhibitor or angiotensin II receptor blocker; if one class is not tolerated, substitute the other

• Multiple drug therapy (two or more agents at maximal doses) generally required to achieve BP targets (B)

• Administer one or more antihypertensive medications at bedtime (A)
ADA Recommendations: Hypertension/Blood Pressure Control

Treatment

• Patients with a blood pressure (BP) >120/80 mmHg should be advised on lifestyle changes to reduce BP (B)

• Patients with confirmed BP ≥140/80 mmHg should, in addition to lifestyle therapy, have prompt initiation and timely subsequent titration of pharmacological therapy to achieve BP goals (B)

ADA Recommendations: Hypertension/Blood Pressure Control

Goals

• People with diabetes and hypertension should be treated to a systolic blood pressure goal of <140 mmHg (B)

• Lower systolic targets, such as <130 mmHg, may be appropriate for certain individuals, such as younger patients, if it can be achieved without undue treatment burden (C)

• Patients with diabetes should be treated to a diastolic blood pressure <80 mmHg (B)
US Adults with HTN expanded
31.9% → 45.6%
72.2 million → 103.3 million

Normal Blood Pressure
Elevated Blood Pressure
High Blood Pressure: Stage 1
High Blood Pressure: Stage 2
The Data
Action to Control Cardiovascular Risk in Diabetes (ACCORD) Blood Pressure Trial

4,733 diabetic patients randomized to intensive BP control (target SBP <120 mm Hg) or standard BP control (target SBP <140 mm Hg) for 4.7 years

- Nonfatal MI, nonfatal stroke, or CV death

Intensive BP control does not reduce a composite of CV events, but does reduce the rate of stroke.

BP=Blood pressure, DM=Diabetes mellitus, HR=Hazard ratio, SBP=Systolic blood pressure

ACCORD study group. NEJM 2010;362:1575-85.
ALLHAT Treatment and Blood Pressure Control

www.hypertensiononline.org

Blood pressure controlled <140/90 mmHg

<table>
<thead>
<tr>
<th></th>
<th>6 mos</th>
<th>1 yr</th>
<th>3 yr</th>
<th>5 yr</th>
</tr>
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<tbody>
<tr>
<td>1 Drug</td>
<td>49.8%</td>
<td>55.2%</td>
<td>62.3%</td>
<td>65.6%</td>
</tr>
<tr>
<td>2 Drugs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Drugs</td>
<td></td>
<td></td>
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</table>
**CENTRAL ILLUSTRATION:** Intensive BP Lowering and Cardiovascular and Safety Outcomes in Older Hypertensive Patients

**Effects of Intensive BP-lowering in Older (≥ 65 Years) Hypertensive Patients**

<table>
<thead>
<tr>
<th>Beneficial effects</th>
<th>Drawbacks/concerns</th>
</tr>
</thead>
<tbody>
<tr>
<td>29% reduction in major adverse cardiovascular (CV) events (MACE)</td>
<td>Patients use an increased number of antihypertensive medications</td>
</tr>
<tr>
<td>33% reduction in CV mortality</td>
<td>Possible increase in renal failure</td>
</tr>
<tr>
<td>37% reduction in heart failure</td>
<td>Possible increase in serious adverse events</td>
</tr>
<tr>
<td></td>
<td>Possible increase in hypotension, syncope and other adverse effects</td>
</tr>
</tbody>
</table>

Most cases were mild and most participants had a complete recovery.
What should be the optimal levels of blood pressure: does the J-curve phenomenon really exist?

A. **INVEST** (CAD patients)

B. **TNT** (CAD patients)

C. **ONTARGET** (high risk pts, mainly with CAD)
J-Curve Phenomenon

![Graph of RR vs. Mean in-study SBP/DBP](image-url)
Minority Populations

• In general, treatment similar for all demographic groups.

• Socioeconomic factors and lifestyle important barriers to BP control.

• Prevalence, severity of HTN increased in African Americans.

• African Americans demonstrate somewhat reduced BP responses to monotherapy with BBs, ACEIs, or ARBs compared to diuretics or CCBs.

• These differences usually eliminated by adding adequate doses of a diuretic.
So Just what is our goal?

• Very soon expect goal BPs will be fully guided by relative risk of organ damage/failure

• For most patients lower blood pressures are better as long as they are asymptomatic

• Develop a Shared Decision making model with your patient

• Patients with Diabetes and CKD at higher risk of kidney injury with tighter control

• High risk patients with multiple comorbidities the goal:
  125-130/<80

• Low risk patients with fewer comorbidities the goal:
  130-139/<90

• Older patients consider goal:
Hypertension guidelines: Treat patients, not numbers

Overall...
Case Study
78-year-old African American Male

Presents for Follow-up of his chronic conditions

Reports that he has been compliant with his medications

He measures his BP one time per week at about noon.

PMH: T2DM, HTN, HLP, CKD, OA

PSH: Appendectomy

FH: 2 siblings with T2DM and HTN
Father with T2DM died from MI on Dialysis

SH: 30 pack year smoker; social ETOH use

Current Medications:

1. Metformin 1000mg twice daily
2. HCTZ 25mg once daily
3. Atenolol 25mg once daily
4. Celebrex 25mg once daily
5. Simvastatin 80mg at bedtime.
Physical Examination

Vitals: BP 165/92mmHg (left arm), P-72, T-97.8 °F, BMI-30
BP 168/99mmHg (right arm)

• GEN: NAD, A&O x4, WD/WN
• HEENT: PERRLA, EOMI, No carotid bruit
• CV: RRR, no m/r/g, nl S1 S2
Thurs 3/7 - 150/91
Weds 3/13 - 160/102
Mon 3/18 - 150-88
Fri 3/24 - 160/80
Sun 4/8 - 198/92
Weds 4/17 - 169/104
Week 4/24 - 164/90
What Labs would you send?

• Complete Metabolic Panel
• CBC
• Hgb A1C
• Lipid Panel
• Urinalysis
  • Urine Microalbumin-Creatinine Ratio
Labs

- K+ 5.1 meq/L
- HCO3 23 meq/L
- Creat 1.5 mg/dL
- BUN 44 mg/dL
- Glucose 165 mg/dL
- eGFR 51 mL/min
- WBC 7,000 IU/mL
- Hgb 13.1 gm/dL
- Hct 39.3%
- Plt 200,000
Labs

- Hgb A1C 8.8%
- Chol 245
- LDL 133
- HDL 34
- Trig 326

Urine Albumin:

- Urinalysis
  - SG 1.025
  - pH 5.5
  - Ketones Negative
  - Protein trace
  - Hemoglobin Negative
  - Nitrite Negative
  - Leukocyte
QUESTIONS?
References


• Dolan E et. al. Superiority of Ambulatory Over Clinic Blood Pressure Measurement in Predicting Mortality: The Dublin Outcome Study. Hypertension 2005;46:156-161

KEEPING OUR MOST PRECIOUS TRAINS ON THE TRACK:
SCREENING EVALUATIONS IN PEDIATRICS

Alissa Craft, DO, MBA
DISCLOSURES

• I am a paid employee of Western University of Health Sciences.
• I have no other conflicts to disclose related to the content of this presentation.
LEARNING OBJECTIVES

1. Describe the newborn screening requirements
2. Understand what defines a reliable and valid screening test
3. Know the screening tests for infants, children, and adolescents
4. Apply screening tests within your practice
QUESTION 1

Screening is a formal process that employs a standardized tool to detect a particular disease state.

A. True
B. False
SCREENING TESTS

- The condition should be an important health problem
- The natural history of the condition should be adequately understood
- There should be an accepted treatment or intervention
- There should be a suitable test that has a high level of accuracy
- The test should be acceptable to the population
- The cost of screening should be economically balanced in relation to possible expenditure on care
- Screening should be a continuing process and not a ‘once and for all’ project
SCREENING TESTS

• **Reliability** means that the scores on the tool will be stable regardless of when the tool is administered, where it is administered, and who is administering it.

• Reliability answers the question: Is the tool producing consistent information across different circumstances?

• **Validity** means that the scores on the tool accurately capture what the tool is meant to capture in terms of content.

• Validity answers the question: Is the tool assessing what it is supposed to assess?
LEAVING THE STATION: NEWBORN SCREENING
NEWBORN METABOLIC SCREENING

- Newborn screenings are done using spots of blood on filter paper that undergo tandem mass spectrometry, isoelectric focusing, and high-performance liquid chromatography.
- Guidelines for newborn screening are decided at the state level, based on federal suggestions distributed by the Secretary’s Advisory Committee on Heritable Disorders in Newborns and Children.
# Newborn Metabolic Screening

<table>
<thead>
<tr>
<th>Category</th>
<th>Condition</th>
<th>Included in California Newborn Screening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic Acid Disorders</td>
<td>Propionic Acidemia</td>
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</tr>
<tr>
<td></td>
<td>Methylmalonic Acidemia</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>(Methylmalonyl-CoA Mutase)</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Methylmalonic Acidemia</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>(Cobalamin Disorders)</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Isovaleric Acidemia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-Methylcrotonyl-CoA Carboxylase Deficiency</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>3-Hydroxy-3-Methylglutaric Aciduria</td>
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<td></td>
<td>Holocarboxylase Synthase Deficiency</td>
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<tr>
<td></td>
<td>β-Ketothiolase Deficiency</td>
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<tr>
<td></td>
<td>Glutaric Acidemia Type I</td>
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<tr>
<td>Fatty Acid Oxidation Disorders</td>
<td>Carnitine Uptake Defect</td>
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<td>Medium-chain Acyl-CoA Dehydrogenase Deficiency</td>
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<td>Very Long-chain Acyl-CoA Dehydrogenase Deficiency</td>
<td>✓</td>
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<td></td>
<td>Long-chain L-3-Hydroxyacyl-CoA Dehydrogenase Deficiency</td>
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<td>Trifunctional Protein Deficiency</td>
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<td>Amino Acid Disorders</td>
<td>Argininosuccinic Aciduria</td>
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<td>Citrullinemia Type I</td>
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</tr>
<tr>
<td></td>
<td>Maple Syrup Urine Disease</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Homocystinuria</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Classic Phenylketonuria</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Tyrosinemia Type I</td>
<td>✓</td>
</tr>
<tr>
<td>Endocrine Disorders</td>
<td>Primary Congenital Hypothyroidism</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Congenital Adrenal Hyperplasia</td>
<td>✓</td>
</tr>
<tr>
<td>Hemoglobin Disorders</td>
<td>S,S Disease (Sickle Cell Anemia)</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>S,a-Thalassemia</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>S,C Disease</td>
<td>✓</td>
</tr>
<tr>
<td>Other Disorders</td>
<td>Biotinidase Deficiency</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cystic Fibrosis</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Classic Galactosemia</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Glycogen Storage Disease Type II (Pompe)</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Mucopolysaccharidosis Type I</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Severe Combined Immunodeficiencies</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X-linked Adrenoleukodystrophy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Critical Congenital Heart Disease</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hearing Loss</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spinal Muscular Atrophy</td>
<td>Planning for 2020</td>
</tr>
</tbody>
</table>
NEWBORN HEARING SCREENING
HEARING LOSS

- **Conductive** hearing loss results from problems occurring in the outer and/or middle ears. On the audiogram, bone conduction thresholds are better than air conduction thresholds. This type of loss attenuates sound as it travels from the outer ear to the inner ear.

- Conductive loss is commonly caused by wax in the ear canal, fluid in the middle ear, or a tear in the eardrum, each of which can be treated medically or surgically.

- **Sensorineural** hearing loss results from pathology associated with the inner ear and/or auditory nerve. Common causes of sensorineural hearing loss in children include congenital factors, infections, or medication exposure.
Central hearing loss is the result of damage or dysfunction in the central auditory nervous system.

This type of loss is due to space-occupying lesions and perceptual processing difficulties.
Hearing loss is the number one birth defect in the United States. Nearly 33 babies are born every day with permanent hearing loss and 1 in 1,000 have a profound hearing loss. Another 2 to 3 in 1,000 have partial hearing loss.

If hearing loss is not detected by 6 months of age, there is an increased risk of delayed speech and language development; poor social, emotional, and cognitive development; and poorer academic development.
Otoacoustic emissions (OAE) are soft sounds produced by most normal inner ears that cannot be heard by other people but can be recorded by sensitive microphones.

OAE provides information about the functional status of outer hair cells (OHCs) in the inner ear over a range of frequencies important for speech processing and perception.

The OAEs are not a test of “hearing” per se, but they are a measure of OHC integrity and are typically present in individuals with normal hearing to a mild hearing loss.
• Auditory brainstem response (ABR) is electrical brain wave activity that is produced by the auditory brainstem in response to sound introduced to the ears. The responses are recorded by a computer and evaluated to determine whether the auditory system is responding as expected to the sound.
QUESTION

• What is the saturation level before a baby looks “blue” to me?

A. 60%
B. 70%
C. 80%
D. 90%
NEWBORN CONGENITAL HEART DISEASE SCREENING

• 18 out of every 10,000 babies are born with a critical congenital heart defect.

• The baby passes screening if the oxygen saturation is 95% or greater in the right hand and foot and the difference is three percentage points or less between the right hand and foot. The screen is immediately failed if the oxygen saturation is less than 90% in the right hand and foot.
ANEMIA

• Anemia screening by finger stick blood samples is recommended by the AAP universally at the 12-month health supervision visit and as determined by risk at the 4-, 18-month and annual visits from age 2 to 21.

• Lead screening is also performed by finger stick blood sample and is recommended at the 12- and 24-month health supervision visit.
TUBERCULOSIS SCREENING

• Every 6 months until age 2 years, then annually, ask the following screening questions for tuberculosis exposure:
  • Has a family member or contact had tuberculosis?
  • Has a family member had a positive tuberculin skin test?
  • Was your child born in a high-risk country?
  • Has your child traveled to, and had contact with resident populations of, a high-risk country for more than 1 week?
The most prevalent childhood developmental delay (by domain) is:

A. Cognitive
B. Learning disability
C. Speech and language
D. Fine Motor
E. Gross Motor
DEVELOPMENTAL SCREENING TESTS

- Screenings are designed to identify risk or potential developmental issues.
- They focus on distinguishing developmental skills and abilities in the lower range of performance and are not useful for capturing skills and abilities in the higher range of performance.
- Screening only indicates the possible presence of developmental delay and cannot definitively identify or describe the nature or extent of a disability.
- Screening must be followed by a more comprehensive and formal evaluation process in order to confirm or disconfirm any red flags raised by the screening procedure.
## Prevalence of Childhood Developmental Delay

<table>
<thead>
<tr>
<th>Type of Delay</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive</td>
<td>1 - 1.5%</td>
</tr>
<tr>
<td>Learning Disability</td>
<td>8%</td>
</tr>
<tr>
<td>Speech and Language</td>
<td>2 - 19%</td>
</tr>
<tr>
<td>Any Delay</td>
<td>15%</td>
</tr>
</tbody>
</table>
The ASQ and PedsTest include an assessment of socioeconomic factors.

A. True
B. False
# Developmental Red Flags

<table>
<thead>
<tr>
<th>RED FLAGS!</th>
<th>Persistence primitive reflexes</th>
<th>Lack of transfer at 7 mos</th>
<th>Problems with feeding and/or swallowing</th>
<th>Lack of developmentally appropriate response to visual stimuli</th>
<th>Emotional dysregulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>REGRESSION (loss of skills) &amp; PARENTAL CONCERN</td>
<td>Abnl tone or mvt patterns at any age, spasticity, hypotonia, absent DTRs</td>
<td>Using one hand exclusively at any age</td>
<td>Parents suspect hearing loss, babbling stops at &gt; 6 mos, lack of response to sound (check hearing!)</td>
<td>No single words by 15 mos</td>
<td>Abnormal attachment patterns (over- clingy, indiscriminate)</td>
</tr>
<tr>
<td>CONCERN are red flags at any age</td>
<td>Asymmetry</td>
<td>Delayed self care (ADLs) at 4 years</td>
<td>No single words by 15 mos</td>
<td>No combos by 24 mos</td>
<td>Limited social smiling and shared enjoyment by 8 mos</td>
</tr>
<tr>
<td></td>
<td>Poor head control at 5 mos</td>
<td>Delayed printing at school entry</td>
<td>Stutter past 3 ½ yrs (or earlier if anxiety/mannerisms)</td>
<td>Stutter past 3 ½ yrs (or earlier if anxiety/mannerisms)</td>
<td>Limited gestures like pointing, response to name, joint attention by 12 mos</td>
</tr>
<tr>
<td></td>
<td>Not sitting independently with hands-free at 8 mos</td>
<td></td>
<td>Idiosyncratic speech, disordered sequence of development</td>
<td>Idiosyncratic speech, disordered sequence of development</td>
<td>Limited social imitative play by 18 mos (e.g. imitating housework)</td>
</tr>
<tr>
<td></td>
<td>Not rolling back-front, not taking weight well through the legs when held at 9 mos</td>
<td></td>
<td>Poor intelligibility for age</td>
<td>Poor intelligibility for age</td>
<td>Limited pretend play (e.g. feeding doll) by 24 mos</td>
</tr>
<tr>
<td></td>
<td>Not walking by 18 mos</td>
<td></td>
<td></td>
<td></td>
<td>No friends at school-age</td>
</tr>
</tbody>
</table>
## Screening Tools

<table>
<thead>
<tr>
<th>Screener Title</th>
<th>Developmental Domains Covered (As listed by publisher)</th>
<th>Age Range</th>
<th>Languages of Screener Materials</th>
<th>Training Available Through Publisher or Developer</th>
<th>Must Be Administered by Someone with Technical Background</th>
<th>Scoring Options (Manual, Electronic)</th>
<th>Screener Includes Parent and Family Input</th>
<th>Screener Includes Guidance on Follow-Up Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages and Stages Questionnaire</td>
<td>Communication, Gross Motor, Fine Motor, Problem Solving, Personal-Social</td>
<td>1 - 66 months</td>
<td>English, Spanish, French</td>
<td>Yes</td>
<td>No</td>
<td>Manual, Electronic</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Ages and Stages Questionnaire: Social-Emotional</td>
<td>Self-regulation, Compliance, Communication, Adaptive functioning, Autonomy, Affect, Interaction with people</td>
<td>6 - 60 months</td>
<td>English</td>
<td>Yes</td>
<td>No</td>
<td>Manual, Electronic</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Brigance Screens</td>
<td>Expressive language, Receptive language, Gross motor, Fine motor, Academics, Pre-academics, Self-help, Social-emotional skills</td>
<td>Birth through end of 1st grade</td>
<td>English</td>
<td>Yes</td>
<td>No</td>
<td>Manual, Electronic</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Early Screening Profiles</td>
<td>Cognitive, Language, Motor, Self-help, Social, Articulation, Home, Health History, Behavior</td>
<td>2 years 0 months through 6 years 11 months</td>
<td>English</td>
<td>Yes</td>
<td>No</td>
<td>Manual</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Screener Title</td>
<td>Developmental Domains Covered (As listed by publisher)</td>
<td>Age Range</td>
<td>Languages of Screener Materials</td>
<td>Training Available Through Publisher or Developer</td>
<td>Must Be Administered by Someone with Technical Background</td>
<td>Scoring Options (Manual, Electronic)</td>
<td>Screener Includes Parent and Family Input</td>
<td>Screener Includes Guidance on Follow-Up Steps</td>
</tr>
<tr>
<td>----------------------------------------</td>
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<td>----------------------------------------------------------</td>
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<td>------------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>FirstSTEP</td>
<td>Cognitive Language Motor Social-emotional skills Adaptive functioning</td>
<td>2 years 9 months through 6 years 2 months</td>
<td>English</td>
<td>No</td>
<td>No</td>
<td>Manual</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Infant Development Inventory</td>
<td>Cognitive Language Motor Social-emotional skills Adaptive functioning</td>
<td>Birth to 18 months</td>
<td>English</td>
<td>No</td>
<td>No</td>
<td>Manual</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Learning Accomplishment Profile-Diagnostic Screen</td>
<td>Social Development Self-Help Gross Motor Fine Motor Language</td>
<td>3 years to 6 years</td>
<td>English Spanish</td>
<td>Yes</td>
<td>No</td>
<td>Manual</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Parents’ Evaluation of Developmental Status</td>
<td>Global/Cognitive Expressive Language and Articulation Receptive Language Fine Motor Gross Motor Behavior Social-Emotional Self-Help School</td>
<td>Birth through 7 years 11 months</td>
<td>English (Forms also translated into 14 other languages.)</td>
<td>Yes</td>
<td>No</td>
<td>Manual Electronic</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Parents’ Evaluation of Developmental Status- Developmental Milestones</td>
<td>Expressive Language Receptive Language Fine Motor Gross Motor Social-Emotional Self-Help Academic Pre-Reading, Pre-Math, and Written Language</td>
<td>Birth through 7 years 11 months</td>
<td>English Spanish</td>
<td>Yes</td>
<td>No</td>
<td>Manual Electronic</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
**SCREENING TOOLS**

<table>
<thead>
<tr>
<th>Screener Title</th>
<th>Developmental Domains Covered (As listed by publisher)</th>
<th>Age Range</th>
<th>Languages of Screener Materials</th>
<th>Training Available Through Publisher or Developer</th>
<th>Must Be Administered by Someone with Technical Background</th>
<th>Scoring Options (Manual, Electronic)</th>
<th>Screener Includes Parent and Family Input</th>
<th>Screener Includes Guidance on Follow-Up Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screener Title</td>
<td>Reliability</td>
<td>Validity</td>
<td>Sensitivity* (High, Moderate, Low)</td>
<td>Specificity* (High, Moderate, Low, Not examined by developer)</td>
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<td></td>
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<tr>
<td>---------------------------------------------------</td>
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<td>----------------------------------------------------------</td>
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<tr>
<td></td>
<td>Inter-Rater Reliability (Acceptable, Low/Weak, Not examined by developer)</td>
<td>Content Validity (Content was reviewed by experts)</td>
<td>Construct Validity (Strong/High, Moderate, Low/Weak, Not examined by developer)</td>
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<tr>
<td>Ages and Stages Questionnaire</td>
<td>Acceptable</td>
<td>Yes</td>
<td>Strong</td>
<td>Moderate, Moderate, Moderate</td>
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<tr>
<td>Ages and Stages Questionnaire: Social-Emotional</td>
<td>Not examined</td>
<td>Not examined</td>
<td>Not examined</td>
<td>Strong</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Bisgance Screens</td>
<td>Acceptable</td>
<td>Acceptable</td>
<td>Moderate</td>
<td>Strong</td>
<td></td>
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<tr>
<td>Developmental Assessment of Young Children, 2nd Edition</td>
<td>Acceptable</td>
<td>Acceptable</td>
<td>Not examined by the developer</td>
<td>Strong</td>
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<td></td>
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<tr>
<td>Early Screening Profiles</td>
<td>Acceptable</td>
<td>Acceptable</td>
<td>Yes</td>
<td>Moderate, Moderate</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>FirstSTEP</td>
<td>Acceptable</td>
<td>Acceptable</td>
<td>Yes</td>
<td>Moderate, Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infant Development Inventory</td>
<td>Not examined</td>
<td>Not examined</td>
<td>Not examined by the developer</td>
<td>Not examined, Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning Accomplishment Profile-Diagnostic Screens</td>
<td>Acceptable</td>
<td>Acceptable</td>
<td>Not examined</td>
<td>Strong</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Parents’ Evaluation of Developmental Status</td>
<td>Acceptable</td>
<td>Acceptable</td>
<td>Yes</td>
<td>Strong</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parents’ Evaluation of Developmental Status-</td>
<td>Acceptable</td>
<td>Acceptable</td>
<td>Not examined</td>
<td>Strong</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developmental Milestones</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Survey of Well-Being of Young Children</td>
<td>Not examined</td>
<td>Acceptable</td>
<td>Yes</td>
<td>Moderate, Not examined</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
### SNAPSHOT MILESTONES

<table>
<thead>
<tr>
<th>Mnemonic</th>
<th>G = Gotta</th>
<th>F = Find</th>
<th>S = Strong</th>
<th>C = Coffee</th>
<th>Social / Emotional</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td><strong>Gross Motor</strong></td>
<td><strong>Fine Motor</strong></td>
<td><strong>Speech / Language</strong></td>
<td><strong>Cognitive / Problem Solving</strong></td>
<td><strong>Social / Emotional</strong></td>
</tr>
<tr>
<td><strong>Newborn</strong></td>
<td>Primitive reflexes – step, place, Moro, Babinski, ATNR Flavor posture</td>
<td>Primitive reflexes – grasp</td>
<td>Primitive reflexes – root, suck</td>
<td>Visual focus length &lt;10&quot;</td>
<td>Bonding (parent → child)</td>
</tr>
<tr>
<td></td>
<td>Mind steady when held</td>
<td></td>
<td>Startles to loud sounds</td>
<td>Fix &amp; follow slow horizontal arc</td>
<td>Self-regulation / soothing</td>
</tr>
<tr>
<td><strong>2 mos</strong></td>
<td>Head steady when held</td>
<td>Head up 45° prone</td>
<td>Hands open half of time</td>
<td>Turns to voice</td>
<td>Prefers usual caregiver</td>
</tr>
<tr>
<td></td>
<td>Head up 45° prone, arms out</td>
<td>Bats at objects</td>
<td>Turns to voice</td>
<td>Prefers high pitched voice</td>
<td>Follows past midline</td>
</tr>
<tr>
<td><strong>4 mos</strong></td>
<td>Sits with support</td>
<td>Head up 90° prone, rolls out</td>
<td>Palm grasp</td>
<td>Prefers usual caregiver</td>
<td>Follows past midline</td>
</tr>
<tr>
<td></td>
<td>Sits well with hands free</td>
<td>Reaches and obtains items</td>
<td>Reaches and obtains items</td>
<td>Prefers high pitched voice</td>
<td>Follows past midline</td>
</tr>
<tr>
<td><strong>6 mos</strong></td>
<td>Postural reflexes</td>
<td>Rolls both ways</td>
<td>Rolling grasp</td>
<td>Prefers usual caregiver</td>
<td>Follows past midline</td>
</tr>
<tr>
<td></td>
<td>Rolls both ways</td>
<td>Transfers hand to hand</td>
<td>babble (specific)</td>
<td>Prefers high pitched voice</td>
<td>Follows past midline</td>
</tr>
<tr>
<td><strong>9 mos</strong></td>
<td>Gets from all 4s → sitting</td>
<td>Inferior pincer grasp</td>
<td>&quot;Mama&quot;, &quot;dada&quot; (specific)</td>
<td>&quot;Mama&quot;, &quot;dada&quot; (specific)</td>
<td>&quot;Mama&quot;, &quot;dada&quot; (specific)</td>
</tr>
<tr>
<td></td>
<td>Sits well with hands free</td>
<td>Picks at objects</td>
<td>Gestures &quot;bye-bye&quot;, &quot;up&quot;</td>
<td>&quot;Mama&quot;, &quot;dada&quot; (specific)</td>
<td>&quot;Mama&quot;, &quot;dada&quot; (specific)</td>
</tr>
<tr>
<td><strong>12 mos</strong></td>
<td>Walks a few steps</td>
<td>Fine pincer (finger tips)</td>
<td>1 word with meaning (besides mama, dada)</td>
<td>Cause &amp; effect</td>
<td>Explore from secure base</td>
</tr>
<tr>
<td></td>
<td>Wide-based gait</td>
<td>Voluntary release</td>
<td>&quot;I want&quot; to name</td>
<td>Trial &amp; error</td>
<td>Points at wanted items</td>
</tr>
<tr>
<td><strong>15 mos</strong></td>
<td>Walks well</td>
<td>Throws objects</td>
<td>1-step command with gesture</td>
<td>Imitates &amp; sounds</td>
<td>Narrative memory begins</td>
</tr>
<tr>
<td></td>
<td>Uses spoon, open top cup</td>
<td>Finger-feeds self choosers</td>
<td>Cause &amp; effect</td>
<td>Imitates &amp; sounds</td>
<td>Narrative memory begins</td>
</tr>
<tr>
<td><strong>18 mos</strong></td>
<td>Stoops and recovers</td>
<td>Uses fork</td>
<td>1-word with meaning</td>
<td>Cause &amp; effect</td>
<td>Imitates &amp; sounds</td>
</tr>
<tr>
<td></td>
<td>Runs</td>
<td>Tower of 4 blocks</td>
<td>&quot;I want&quot; to name</td>
<td>Cause &amp; effect</td>
<td>Imitates &amp; sounds</td>
</tr>
<tr>
<td><strong>2 yr</strong></td>
<td>Jumps on two feet</td>
<td>Handstands established</td>
<td>Causes &amp; effect</td>
<td>New problem-solving strategies</td>
<td>Separates easily</td>
</tr>
<tr>
<td></td>
<td>Up &amp; down stairs &quot;marking time&quot;</td>
<td>Uses fork</td>
<td>Causes &amp; effect</td>
<td>New problem-solving strategies</td>
<td>Separates easily</td>
</tr>
<tr>
<td><strong>3 yr</strong></td>
<td>Pedals trike</td>
<td>Handstands established</td>
<td>Causes &amp; effect</td>
<td>Separates easily</td>
<td>Separates easily</td>
</tr>
<tr>
<td></td>
<td>Up stairs alternating feet</td>
<td>Uses fork</td>
<td>Causes &amp; effect</td>
<td>Separates easily</td>
<td>Separates easily</td>
</tr>
<tr>
<td><strong>4 yr</strong></td>
<td>Hops on one foot</td>
<td>Draws x, L, diagonal</td>
<td>Causes &amp; effect</td>
<td>Separates easily</td>
<td>Separates easily</td>
</tr>
<tr>
<td></td>
<td>Down stairs alternating feet</td>
<td>Cuts shape with scissors</td>
<td>Causes &amp; effect</td>
<td>Separates easily</td>
<td>Separates easily</td>
</tr>
<tr>
<td><strong>5 yr</strong></td>
<td>Balance on one foot 10 secs</td>
<td>Draws and, diagonals</td>
<td>Sentences, 100% intelligible</td>
<td>Causes &amp; effect</td>
<td>Has preferred friend</td>
</tr>
<tr>
<td></td>
<td>Skips</td>
<td>Cuts shape with scissors</td>
<td>Tells a story</td>
<td>Causes &amp; effect</td>
<td>Has preferred friend</td>
</tr>
</tbody>
</table>

- **S** = Soon: Expresses emotions: happy, sad, mad Memory lasts > 24 hrs
- **G** = Gotta: Primitive reflexes – step, place, Moro, Babinski, ATNR Flavor posture
- **F** = Find: Primitive reflexes – grasp
- **C** = Coffee: Visual focus length <10"
A 3-year-old Bright Futures screening includes assessment of all of the following EXCEPT:

A. Body Mass Index
B. Anticipatory Guidance for the next year
C. Head Circumference
D. Observation of Parent Interaction with the child
E. Immunization Status
<table>
<thead>
<tr>
<th>18 Month</th>
<th>2 Year</th>
<th>Autism Spectrum Disorder</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Modified Checklist for Autism in Toddlers, Revised, with Follow-Up (M-CHAT-R/F)</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Translations</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Survey of Well-being of Young Children (SWYC)</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Parent's Observations of Social Interactions)</td>
</tr>
</tbody>
</table>
# Developmental Screening

<table>
<thead>
<tr>
<th>Age</th>
<th>Child Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 Month</td>
<td><a href="#">AAP “Developmental Screening Tools” table</a></td>
</tr>
<tr>
<td>18 Month</td>
<td>[Ages &amp; Stages Questionnaires, Third Edition (ASQ-3)]</td>
</tr>
<tr>
<td>2½ Year</td>
<td>[Parents’ Evaluation of Developmental Status (PEDS)]</td>
</tr>
<tr>
<td></td>
<td>[Survey of Well-being of Young Children (SWYC)] (milestones)</td>
</tr>
</tbody>
</table>
### Key Screening Tests

<table>
<thead>
<tr>
<th>Tool</th>
<th>Validated?</th>
<th>Number of items</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>Age range assessed</th>
<th>Time to complete; time to score*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages and Stages Questionnaire, 3rd ed.</td>
<td>Yes²⁹</td>
<td>40, including 10 parental questions¹⁸</td>
<td>86³⁰</td>
<td>85³⁰</td>
<td>One to 66 months³⁰</td>
<td>10 to 15 minutes; One to three minutes³⁰</td>
</tr>
<tr>
<td>Child Development Review–Parent Questionnaire</td>
<td>Yes³¹</td>
<td>32 questions; 99 additional items³¹</td>
<td>68³¹</td>
<td>88³¹</td>
<td>18 months to five years³¹</td>
<td>15 to 20 minutes total³¹</td>
</tr>
<tr>
<td>Infant Development Inventory</td>
<td>No¹⁵</td>
<td>85³¹</td>
<td>75 to 85¹⁵,²⁷,³¹</td>
<td>70 to 77¹⁵,²⁷,³¹</td>
<td>Up to 18 months³¹</td>
<td>Five to 10 minutes total³¹</td>
</tr>
<tr>
<td>Parents’ Evaluation of Developmental Status</td>
<td>Yes¹⁵</td>
<td>10¹³,³²</td>
<td>74 to 80²⁷,³⁰</td>
<td>70 to 80²⁷,³⁰</td>
<td>Birth to seven years and 11 months³²</td>
<td>Two minutes total³²</td>
</tr>
</tbody>
</table>

*Times to complete and score assume manual completion and scoring. Online completion, completion before appointments, and online auto-scoring would reduce the time spent on these activities during the clinic visit.
ORAL HEALTH SCREENING

<table>
<thead>
<tr>
<th>Universal</th>
<th>Oral Health</th>
<th>AAP Oral Health Risk Assessment (OHRRA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If No Dental Home</td>
<td>Oral Health</td>
<td>AAP Oral Health Risk Assessment (OHRRA)</td>
</tr>
<tr>
<td>12 Month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 Month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Year</td>
<td></td>
<td></td>
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<tr>
<td>2½ Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Year</td>
<td></td>
<td></td>
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<tr>
<td>4 Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Year</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• One in 5 children grows up in a household where someone abuses alcohol or other drugs.
• Substance use by a family member is associated with higher rates of use in adolescents.
• Poor parental supervision and household disruption are associated with involvement in substance use and other risk behaviors.
• Low academic achievement and/or academic aspirations.
• Untreated attention-deficit disorder (ADD) and attention-deficit/hyperactivity disorder (ADHD).
SUBSTANCE USE STATISTICS

• More than 30% of all deaths from injuries can be directly linked to alcohol.

• Substance use also is associated with school failure, respiratory diseases, and high-risk sexual behaviors.

• 46% of adolescents have tried alcohol by eighth grade, and by senior year in high school 77% of adolescents have begun to drink.

• 20% of eighth graders and 58% of seniors have been drunk.
<table>
<thead>
<tr>
<th>Age Group</th>
<th>Tobacco, Alcohol, or Drug Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 Through 14 Year</td>
<td>Alcohol Screening and Brief Intervention for Youth: A Practitioner's Guide</td>
</tr>
<tr>
<td></td>
<td>Brief Screener for Alcohol, Tobacco, and other Drugs (BSTAD)</td>
</tr>
<tr>
<td>15 Through 17 Year</td>
<td>Car, Relax, Alone, Forget, Friends, Trouble (CRAFFT)</td>
</tr>
<tr>
<td>18 Through 21 Year</td>
<td>Screening to Brief Intervention (S2BI)</td>
</tr>
<tr>
<td>Stage</td>
<td>Intervention Goal</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>Abstinence</td>
<td>Positive reinforcement, anticipatory guidance</td>
</tr>
<tr>
<td>Experimentation</td>
<td>Education about risks</td>
</tr>
<tr>
<td>Non-problematic use</td>
<td>Risk-reduction advice (eg, driving/riding while impaired)</td>
</tr>
<tr>
<td>Problem use</td>
<td>Brief intervention (BI)— see below</td>
</tr>
<tr>
<td>Abuse</td>
<td>BI, outpatient counseling, follow-up</td>
</tr>
<tr>
<td>Dependence</td>
<td>Referral to intensive/residential treatment</td>
</tr>
<tr>
<td>Secondary abstinence</td>
<td>Positive reinforcement, support, follow-up</td>
</tr>
<tr>
<td>Age Group</td>
<td>Tool</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>11 Through 14 Year</td>
<td>Depression (beginning at age 12)</td>
</tr>
</tbody>
</table>
| 15 Through 17 Year| PHQ-9 Modified for Adolescents (PHQ-A)<sup>b</sup>  
A version of the PHQ-A should be available when the new *Guidelines for Adolescent Depression in Primary Care Toolkit* is posted.  
Another sample of the PHQ-A is available through the *Community Care of North Carolina*.  
PHQ-2<sup>b</sup>  
- Bright Futures sample form  
- Instructions |
Screening for Stroke: What are the Risks for Women?

Dan Miulli, DO, FACOS
Stroke Medical Director
ARMC
June 22, 2019
Disclosure I have:

• **No** Commercial interest or support
• **No** Financial relationships with outside individuals or companies
• **No** Conflict of interest
Cultural Barriers

- **Language Barrier** could lead to delay
  - Availability of translators crucial
- **Personal Beliefs creating treatment issues**
  - Concern regarding whether stroke necessitates detailed explanations
- **Ethno cultural beliefs that delay treatment**
  - Concern regarding treatment at certain ages
Objective

- Determine how stroke risk factors influence pathophysiology of stroke in Women
- Describe the outcomes of stroke in women
- Describe how treatment of risk factors reduce chance of stroke in women
Women & Stroke

- 3rd cause of death in US women
- Kills TWICE as many women as breast cancer annually
- Women have more strokes than men
- Women have worse recovery than men
- >100,000 under 65 will have a stroke annually
WHY?
Time is Brain

Acute ischemic stroke
Every minute the brain loses

1.9 million neurons
14 billion synapses
7.5 miles myelinated fibers

-- Saver, Stroke 2006
Cardiovascular disease is still killing more women than the next four causes of death combined including all forms of cancer.
Stroke: Major Public Health Burden

- Most preventable catastrophic conditions
- Leading cause of adult disability
- Fifth leading cause of death

- One stroke occurs in the US every 40 seconds
- >150,000 deaths per year in US ↓
- >795,000 new strokes per year in US ↑
- >4,400,000 stroke survivors in US
- 60% stroke deaths outside hospital
How Bad is a Major Stroke?


- Worse than death
- Equivalent to being well
- Equivalent to death

Diagram showing the percentage of outcomes post-major stroke, with a significant portion indicated as worse than death.
Risk Factors you can control

- Smoking
- High blood pressure
- High blood cholesterol and high triglycerides
- Overweight/obesity
- Physical inactivity
- Diabetes and prediabetes
- Metabolic syndrome

American Heart Association March 2019 “Fact Sheet: Women’s No. 1 Health Treat”
Modifiable Stroke Risk Factors

**Medical Conditions**
- Hypertension
- Cardiac disease
- Atrial fibrillation
- Hyperlipidemia
- Diabetes mellitus
- Carotid stenosis
- Elevated homocysteine
- Prior TIA or stroke

**Behaviors**
- Cigarette smoking
- Heavy alcohol use
- Physical inactivity
Risk Factors of Stroke in Women

- Pregnancy
- Pre-eclampsia
- Birth Control Pills
- Hormone replacement therapy
- Migraine with aura combined with smoking

American Heart Association March 2019 “Fact Sheet: Women’s No. 1 Health Treat”
The Adult - Foundational Problem

- 68% overweight
- 48% cholesterol >200 mg/dl
- 38% hypertension
- 33% no vigorous physical activity
- 23.1% men & 18.1% women smokers
- 9% physician diagnosed diabetes
- <1% have ideal healthy diet
- No children meet the goal
<table>
<thead>
<tr>
<th>Health Indicator</th>
<th>Poor</th>
<th>Intermediate</th>
<th>Ideal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blood Pressure</strong></td>
<td>Adults &gt;20 years of age: SBP ≥140 or DBP ≥90 mm Hg or &gt;95th percentile</td>
<td>SBP120-139 or DBP 80-89 mm Hg or treated to goal</td>
<td>&lt;120/&lt;80 mm Hg</td>
</tr>
<tr>
<td></td>
<td>Children 8-19 years of age: 90th-95th percentile or SBP ≥120 or DBP ≥80 mm Hg</td>
<td>&gt;95th percentile</td>
<td>&lt;90th percentile</td>
</tr>
<tr>
<td><strong>Physical Activity</strong></td>
<td>Adults &gt; 20 years of age: None</td>
<td>1-149 min/wk mod or 1-74 min/wk vig or ≥149 min/wk mod + vig</td>
<td>150+ min/wk mod or 75+ min/wk vig or 150+ min/wk mod + vig</td>
</tr>
<tr>
<td></td>
<td>Children 12-19 years of age: None</td>
<td>60+ min of moderate or vigorous every day</td>
<td>60+ min of mod or vig every day</td>
</tr>
<tr>
<td><strong>Cholesterol</strong></td>
<td>Adults &gt;20 years of age: ≥240 mg/dL</td>
<td>200-239 mg/dL or treated to goal 170-199 mg/dL</td>
<td>&lt;170 mg/dL</td>
</tr>
<tr>
<td></td>
<td>Children 6-19 years of age: ≥200 mg/dL</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥200-239 mg/dL</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥100-125 mg/dL or treated to goal</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Healthy Diet</strong></td>
<td>Adults &gt;20 years of age: 0-1 components</td>
<td>2-3 components</td>
<td>4-5 components</td>
</tr>
<tr>
<td></td>
<td>Children 5-19 years of age: 0-1 components</td>
<td>2-3 components</td>
<td>4-5 components</td>
</tr>
<tr>
<td></td>
<td>2-3 components</td>
<td>4-5 components</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥25 - 29.9 kg/m² or 85th-95th percentile</td>
<td>≥30 kg/m² or &gt;95th percentile</td>
<td></td>
</tr>
<tr>
<td><strong>Healthy Weight</strong></td>
<td>Adults &gt; 20 years of age: ≥30 kg/m² or ≥95th percentile</td>
<td>25-29.9 kg/m² or 85th-95th percentile</td>
<td>&lt;25 kg/m² or &lt;85th percentile</td>
</tr>
<tr>
<td></td>
<td>Children 2-19 years of age: ≥30 kg/m² or &gt;95th percentile</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Smoking Status</strong></td>
<td>Adults &gt;20 years of age: Current Smoker Tired prior 30 days</td>
<td>Former ≤ 12 mos</td>
<td>Never /quit ≥ 12 mos</td>
</tr>
<tr>
<td></td>
<td>Children (12–19)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Blood Glucose</strong></td>
<td>Adults &gt;20 years of age: 126 mg/dL or more</td>
<td>100-125 mg/dL or treated to goal 100-125 mg/dL</td>
<td>Less than 100 mg/dL</td>
</tr>
<tr>
<td></td>
<td>Children 12-19 years of age: 126 mg/dL or more</td>
<td></td>
<td>Less than 100 mg/dL</td>
</tr>
</tbody>
</table>
Risk Factors you can NOT control

- Family history of early heart disease
- Age (55 and older for women)
- Pregnancy related complications
- Auto-immune disease
Risk Factors: Relative Risk compared to Men

- Diabetes: almost doubles the risk of fatal CAD
- Smoking:
  - associated with 50% of all coronary events in women
  - Risk elevated even with minimal use
  - Women who smoke have a six-fold increased risk of MI (vs. 3x in men)
  - Risk was higher for women smokers than men regardless of age

Zianetti G et al. JACC 1993;22:1788; Willett WC et al. NEJM 1987;317:1303
## Risk Factors: Relative Risk compared to Men

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Prevalence vs Men</th>
<th>Relative Risk vs Men</th>
<th>Sex Specific</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>↓</td>
<td>↑↑</td>
<td></td>
</tr>
<tr>
<td>Diabetes/Metabolic Syndrome</td>
<td>↑</td>
<td>↑↑↑</td>
<td>Gestational DM PCOS</td>
</tr>
<tr>
<td>Hypertension</td>
<td>↑</td>
<td>↑</td>
<td>Preeclampsia Gestational HTN</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Physical Inactivity/ Poor Fitness</td>
<td>↑↑</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>Obesity</td>
<td>↑</td>
<td>-/↑</td>
<td>Postpartum Weight Gain</td>
</tr>
<tr>
<td>Depression</td>
<td>↑↑↑</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>SLE/RA</td>
<td>↑↑↑</td>
<td>↑↑</td>
<td></td>
</tr>
</tbody>
</table>

American Heart Association March 2019 “Fact Sheet: Women’s No. 1 Health Treat”
Reproductive Risk Factors

- **Pregnancy-related**
  - “failed stress test”
  - Pre-eclampsia – 3.8x more likely to develop DM, 11.6x more likely to develop HTN requiring rx
  - Gestational DM: up to 70% develop DM within 5 years

- **Menopause**
Other Risk Factors

- Sleep apnea
- Stress or depression
- Too much alcohol
- Birth control pills (particularly for women who are over age 35 and smoke)
Talking Brain to Brain

- The Multiplier Effect
  - 1 risk factor doubles your risk
  - 2 risk factors quadruple your risk
  - 3 or more risk factors can increase your risk more than tenfold

American Heart Association March 2019 “Fact Sheet: Women’s No. 1 Health Treat”
Education

80% of strokes can be prevented

37% of all Americans cannot accurately identify even one warning sign for stroke.

AHA/ASA Warning Signs Research, Dec. 2011
Cost

- CVD including Stroke account for 14% of total health care expenditure 2012-2013
- More than any major diagnostic group
- Direct and indirect US cost $316.1 Billion
  - Projected 2030 $918 Billion
FACT(s)

- Most Women do not know that vascular disease is their OWN greatest health risk
- Biggest health concern for Women living in the United States is breast cancer
- Most of the Women (and the society) think vascular disease is men’s disease
- Most of the Women ignore their vascular disease related symptoms
- When asked 6 out of 10 women don’t know their Blood Pressure, Blood Sugar, Cholesterol numbers

American Heart Association March 2019 “Fact Sheet: Women’s No. 1 Health Treat”
Women are referred less often for appropriate testing or treatment.

Women are more likely to wait before presenting to medical attention.

Women with heart attack are more likely to have complications and increased mortality.

Women are roughly 10 years older than men when they present, and have more co-morbidities.

Young women also develop coronary artery disease and have a worse prognosis than men.
Cardiovascular Disease Death trends for Males and Females

Mozaffarian D et al. Circulation. 2015;131:e29-e322
Death rates for women in United States

Women & Stroke

• Stroke kills more than **twice** as many American women every year as breast cancer

• More **women** than men **die** from stroke

• Women over age 30 who smoke and take high-estrogen oral contraceptives have a **stroke risk 22 times** higher than average

American Heart Association March 2019 “Fact Sheet: Women’s No. 1 Health Treat”
1707 patients with TIA identified by emergency department physicians

Probability of Survival Free From Stroke and Adverse Events

Days After TIA

Number of Patients at Risk
Stroke: 1001 1577 1527 1480 1451
Adverse events: 1001 1462 1361 1293 1248

WOMEN = small MEN
BIKINI APPROACH TO WOMEN’s CV HEALTH

“... The medical community has viewed women’s health almost with a ‘bikini’ approach, looking essentially at the breast and reproductive system, and almost ignoring the rest of the woman as part of women’s health”

Nanette Wenger, MD
Emory University

Purvi Parwani, MD, lecture, Cardiovascular disease in women: talking heart to heart, February 2019 ARMC Go Red for Women
YENTL SYNDROME

- Exclusion of women in cardiovascular trials
- Women are however treated based on the study results that excluded women
- Assumption that if women (and disease) present like MEN – They will be taken seriously

Dr. Bernadine Healy

Purvi Parwani, MD, lecture, Cardiovascular disease in women: talking heart to heart, February 2019 ARMC Go Red for Women
YENTL SYNDROME

Yentl

From Wikipedia, the free encyclopedia

For the film adaptation, see Yentl (film).

Yentl is a play by Leah Napolin and Isaac Bashevis Singer.

Based on Singer's short story "Yentl the Yeshiva Boy," it centers on a young girl who defies tradition by discussing and debating Jewish law and theology with her rabbi father. When he dies, she cuts her hair, dresses as a man, and sets out to find a yeshiva where she can continue to study Talmud and live secretly as a male named Anshel. When her study partner Avigdor discovers the truth, Yentl's assertions that she is "neither one sex nor the other" and has "the soul of a man in the body of a woman" suggest the character is undergoing a gender identity crisis, especially when she opts to remain living as Anshel for the rest of her life.
The Red Dress®

The national symbol for women and cardiovascular disease awareness.
# Death rates for women in United States

<table>
<thead>
<tr>
<th>Condition</th>
<th>Lifetime risk at age 40</th>
<th>Lifetime risk at age 70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any CVD</td>
<td>1 in 2</td>
<td>1 in 2</td>
</tr>
<tr>
<td>Coronary Artery disease</td>
<td>1 in 3</td>
<td>1 in 4</td>
</tr>
<tr>
<td>Stroke</td>
<td>1 in 5</td>
<td>1 in 5</td>
</tr>
<tr>
<td>Breast Cancer</td>
<td>1 in 8</td>
<td>1 in 15</td>
</tr>
</tbody>
</table>

*go et al. Circulation. 2014; 129: e28-e292 slide courtesy: Dr. Martha Gulati*
FACT

WOMEN v MEN

Purvi Parwani, MD, lecture, Cardiovascular disease in women: talking heart to heart, February 2019 ARMC Go Red for Women
WOMEN v MEN

SEE THEMSELVES IN THE MIRROR

Slide courtesy: Dr. Martha Gulati
WOMEN v MEN

UNspoken communication

Girls

- Check out hair
- Evaluate skin
- Inspect jewelry
- I've seen that top
- Is that a real tank?
- Compare figures
- How are you feeling?
- Have you started your period?
- How was your date?
- What are your plans?
- How's your day been?
- Hello! What's up?
- How was your weekend?
- Why are you smiling?
- How was your day?
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WOMEN’s v MEN’s cardiovascular disease
WOMEN’s v MEN’s cardiovascular disease

Generalized narrowing

Localized stenosis

Purvi Parwani, MD, lecture, Cardiovascular disease in women: talking heart to heart, February 2019 ARMC Go Red for Women
WOMEN’s v MEN’s cardiovascular disease

Men -> Explode

Women -> Erode

Libby et al NEJM 2013
WOMEN’s symptoms v MEN’s cardiovascular disease symptoms

SIGNS OF A HEART ATTACK
Symptoms Every Woman Should Know and Pay Attention to
Women and men may differ in their experience of heart attack symptoms, as women are more likely to have unusual or “atypical” signs of a heart attack. Some of these may come and go before a heart attack occurs.

- Nausea or vomiting
- Dizziness or lightheadedness
- Shortness of breath with or without chest discomfort
- Discomfort or pressure in the center of the chest that lasts more than a few minutes, or goes away and returns
- Pain in one or both arms, upper back, neck, jaw, or stomach
- Paleness or clammy skin
- Fainting
- Inability to sleep
- Breaking out in a cold sweat
- Unusual fatigue

Purvi Parwani, MD, lecture, Cardiovascular disease in women: talking heart to heart, February 2019 ARMC Go Red for Women
WOMEN’s vascular disease symptoms

- Chest discomfort
- Upper Body Discomfort
- Shortness of breath
- Sweats
- Fatigue
- Nausea
- Dizziness
WOMEN’s v MEN’s vascular disease

Purvi Parwani, MD, lecture, Cardiovascular disease in women: talking heart to heart, February 2019 ARMC Go Red for Women
WOMEN v MEN

- Women comprise only 27% of participants in all heart-related research studies.
- Women were treated based on diagnostic created for men.
- Very little money spent on the questions related to heart disease in women.
- How can you diagnose and treat a woman for a life threatening disease based on the research done on men when women’s cardiovascular disease is different than men?

American Heart Association March 2019 “Fact Sheet: Women’s No. 1 Health Treat”
Cardiovascular Disease Death trends for Males and Females

American Heart Association March 2019 “Fact Sheet: Women’s No. 1 Health Treat”
Stroke Incidence in Women

- In 1999: 102,000 women died of stroke

- Women have less strokes than men but higher mortality (60% vs 34%)

- Women have worse outcomes than men (quality of life, depression, disability)
Stroke during Child-bearing Age

- Incidence is low—about 11 per 100,000

- During pregnancy rate of stroke increases

- During 1979-1991, rate of stroke was 29 per 100K deliveries

- During 2000-2001, rate was 34.2 per 100k deliveries

- Majority of above strokes occur post-partum

Chander Malhotra, MD lecture, Stroke in women and minorities, November 2011 ARMC Stroke Summit
Postpartum period and Stroke

- Majority of pregnancy-related strokes occur postpartum
- One study identified 48% during postpartum, 41% at delivery and 11% antepartum
- Another study found a 5-fold increased risk of ischemic stroke in postpartum and 18-fold increase in ICH

Chander Malhotra, MD lecture, Stroke in women and minorities, November 2011 ARMC Stroke Summit
Physiology of Pregnancy Contributing to Increased Risk of Stroke

- Increased plasma volume – decreased blood viscosity
- Hypercoagulable state
- Platelet aggregation
- Decreased fibrinolysis, Protein C&S
- Increased Fibrinogen, Factors 7,8,9, 10, and 12
- Increased Clot Inhibitor consumption leading to Protein C resistance
- Extends at least 2-3 weeks postpartum
- Hormonal influences on cerebral vessels
- Intimal hyperplasia, medial thickening
- Growth factors
Risk Factors For Stroke in Pregnancy

- Advanced Maternal Age
- Migraine
- Thrombophilia
- Lupus, Anti-Phospholipid Antibody Syndrome
- Sickle cell disease
- Preeclampsia
- PRES-Posterior Reversible Encephalopathy Syndrome
Preeclampsia and Stroke

- Nationwide inpt sampling 1993-2002, preeclampsia/gestational HTN associated with 10-fold increased risk of pregnancy-related ICH

- Preeclampsia also poses a risk for stroke later in life as a result of endothelial dysfunction, HTN and an increase in cardiovascular risk factors
Oral Contraceptives and Stroke

- Thirty years of studies show 2-fold increased risk of stroke in Users over Non-users
- Hypertension and smoking are major risk factors for stroke in women using oral contraceptives
- WHO collaborative study found that women with migraine who used OCP’s had 8 fold increased risk of ischemic stroke than those with either risk factor alone and 16-fold increase than those with neither risk factor, smoking added risk to about 34-fold
- Obesity along with OCP use
- Women who have migraines without auras and no other stroke risk factors can safely take OCP’s
Menopause and Stroke

Women age 45-54 have significantly higher odds of stroke compared to men of the same age.

Risk of stroke is elevated with hormone therapy

Hormone therapy only helps vasomotor symptoms and osteoporosis
Stroke in Older Women

- With the exception of midlife surge, women appear to be protected from stroke until oldest age groups
- Larger number of old age women means more deaths from stroke
- Life time risk of stroke in women is about 20% and for all cardiovascular disease is 40%
Guidelines for Stroke Prevention

1. Life style/ smoking cessation, heart-healthy diet
2. Blood pressure control
3. LDL< 100mg/dl
4. Aspirin or other antiplatelet agents for secondary prevention
5. Diabetes control
6. Weight management-- BMI 18.5 to 24.9
7. Exercise – 30 min of moderate-intensity physical activity( brisk walking) on most days of week
HRT and Stroke Prevention

- Estrogen is prothrombotic (thromboembolic stroke, venous thromboembolism 7-18/100,000)

- WHI: HRT increased stroke incidence but not mortality (relative risk 1:20)

Hypercoagulable Disorders
Stroke in the Young <50 y.o. Workup

- Antiphospholipid Antibodies
- Lupus
- Paraneoplastic
- Protein C&S
- Factor V Leiden
- Homocysteine
- Prothrombin mutation
- Antithrombin III
Acute Stroke Therapy in Pregnancy

- ASA if no bleed on CT
- No TPA
- Coumadin between 14-36 weeks of pregnancy
- Heparin – A. fib, Mechanical heart valve, Dissection, Embolic source, DVT, APA+
- Eclampsia – BP and seizure control, maintain kidney function, terminate pregnancy
Risk of Recurrent Ischemic Stroke

- A previous ischemic stroke is not a contraindication to subsequent pregnancy
- Confirmed risk of stroke increases postpartum
- 441 women (373 arterial ischemic; 68 with CVT) with 5 year follow-up
- Outcome of subsequent pregnancies similar to general population except when additional risk factor identified
Does pregnancy increase the risk of bleeding from AVMs or Aneurysms?

- Wait until 1 year after AVM event before getting pregnant or until embolic therapy is completed
- Vaginal delivery is not associated with increasing rate of bleed
- Shorten second stage of labor
Table 5. (Unaided) Responses to Signs of a Heart Attack in 2012 by Racial/Ethnic Group

<table>
<thead>
<tr>
<th>Response (Unaided)</th>
<th>Overall, 2012</th>
<th>White (a)</th>
<th>Black (b)</th>
<th>Hispanic (c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you thought you were experiencing signs of a heart attack, what is the first thing you would do?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Call 9-1-1</td>
<td>65</td>
<td>63</td>
<td>65</td>
<td>73</td>
</tr>
<tr>
<td>Take an aspirin</td>
<td>20</td>
<td>22(^c)</td>
<td>18(^c)</td>
<td>10</td>
</tr>
<tr>
<td>Go to the hospital</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Call a family member</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Call your doctor</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>5(^a)</td>
</tr>
<tr>
<td>If you thought someone else was experiencing signs of a heart attack, what is the first thing you would do?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Call 9-1-1</td>
<td>81</td>
<td>80</td>
<td>78</td>
<td>87</td>
</tr>
<tr>
<td>Advise him/her to take an aspirin</td>
<td>11</td>
<td>13(^c,d)</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>Take him/her to the hospital</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Tell him/her to call the doctor</td>
<td>1</td>
<td>—</td>
<td>—</td>
<td>2(^a)</td>
</tr>
<tr>
<td>Call his/her spouse or family member</td>
<td>—</td>
<td>…</td>
<td>—</td>
<td>…</td>
</tr>
</tbody>
</table>

All values are weighted percentages among telephone respondents. Letters denote significant differences in columns for racial/ethnic and age groups at \(P<0.05\). Dash indicates small base sample <100; …, empty cell.
Good News!

80% of the women’s cardiovascular disease issues are preventable!!

Why Women Don’t Take Action Against Cardiovascular Disease

- They think it’s just a man’s disease
- They don’t make their health a top priority
- They think they’re not old enough to be at risk
- They feel too busy to make changes in their lives
- They’re already feeling stressed
- They’re tired
Talking Brain to Brain
What can you do?

- Begin today—make changes one step at a time
- Don’t smoke—if you are a smoker, ask your health care provider for help in quitting
- Be physically active
  - 2 hours and 30 minutes of moderate-intensity aerobic activity each week,
  - 10 K steps,
  - 60 minutes for weight loss
- Add strength training—2 to 3 times a week
Talking Brain to Brain
What can you do?

- Follow a healthy eating plan
  - Low in carbohydrate and fat
  - Choose fish, poultry, and lean cuts of meat; avoid red meat
  - Color your Plate:
    - Less color with meat (Avoid Red Meat)
    - More colors with veggie: Three colors on the plate
  - Choose a variety of whole grains, fruits, and vegetables daily (Eat whole food with nutrients—fruits instead of fruit juices)
  - Avoid extra calories in soda
BP control

- Reduce salt intake
- Avoid canned and frozen foods (sodium as a preservative)
- Use spices to lessen the salt use
- Avoid alcohol
- Quit Smoking
The Multiplier Effect

<table>
<thead>
<tr>
<th>Lifestyle Risk Factor</th>
<th>Reduced Risk of developing cardiovascular disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not smoking</td>
<td>▼ 71%</td>
</tr>
<tr>
<td>Exercise more than 2.5 hours a week</td>
<td>▼ 28%</td>
</tr>
<tr>
<td>Healthy eating index (top 40%)</td>
<td>▼ 31%</td>
</tr>
<tr>
<td>Alcohol ≤ 1 drink/day</td>
<td>▼ 33%</td>
</tr>
<tr>
<td>Normal BMI</td>
<td>▼ 32%</td>
</tr>
<tr>
<td>TV watching &lt;7 hours/week</td>
<td></td>
</tr>
</tbody>
</table>

Women who engaged in all the 6 healthy lifestyles had 92% lower risk of getting the cardiovascular disease

Chomistek et al JACC 2015
Key tests to know your stroke risk

- Blood pressure
- Blood cholesterol (total: HDL, LDL, triglycerides)
- Fasting plasma glucose (diabetes test)
- Body mass index (BMI) and waist circumference
- EKG
- Stress test
• Low HDL is more predictive than high LDL
• Lp (a) can be more predictive in younger women
• TG can be more predictive in older women, especially if >400 mg/dL

Weight loss

- Restrictions on Carbohydrate
- Eat whole food with nutrients (fruits instead of fruit juices)
- Avoid extra calories in soda
- Exercise
  - 30 minutes x 5 times a week
  - 60 minutes daily for weight loss
  - At least 10K steps everyday
“As we develop in utero, the human heart is the first organ to begin forming. In traditional Chinese medicine, the inner spiritual core of the self is deemed to reside, not in the head, but in the heart. The heart does not just pump — what it does is listen. The heart senses and integrates our thoughts, our emotions, and our will to carry out tasks. The heart actually is a sensitive integrator of all our experience. Ancient cultures saw the heart as the seat of the soul. A human being has dual hearts — the first a pulsating fist of muscle in the chest; the second, a precious cabal of communicating neurons that create feeling, longing, and love. Many idioms attest to this ‘second’ heart, the social-emotional heart. For instance, sorrow is heartbreak. Sincere intentions are heartfelt. To be compassionate is to be openhearted, devoid of compassion — heartless. To follow one’s heart means to act on the basis of an intuitive sense of one’s own most fulfilling option. To hearten is to encourage, and our English word courage is itself derived from the French word, coeur, meaning heart.”

https://www.huffingtonpost.com/barbra-streisand/womens-heart-health_b_1135486.html
References

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