IDAHO DIABETES
PREVENTION & CONTROL

IDAHO
HEART DISEASE &
STROKE PREVENTION

Dear Health Care Professional,

Thank you for your interest in the Idaho "Blood Pressure Toolkit". We hope you will use the video and information to continue to provide accurate blood pressure readings and improve blood pressure control for your patients. After viewing the video and materials, you may request a certificate of completion, to be used towards educational hours, by completing the evaluation form. This Toolkit is a result of collaboration between the Idaho Heart Disease and Stroke Prevention Program, the Idaho Diabetes Prevention and Control Program, and Boise State School of Nursing.

In 2015, 31.2 % of Idaho adults surveyed reported being diagnosed with high blood pressure. We expect that we are close to the national estimates of 1 in 3 adults when those with undiagnosed high blood pressure are included.

As you are aware, high blood pressure is one of the major modifiable risk factors for cardiovascular disease and diabetes. Proper blood pressure measurements are vital for decisions regarding major diagnostic and therapeutic recommendations and must be correct, valid, and reliable. When diagnosed early, Idaho citizens can change behaviors that can have serious consequences on their quality of life. This is especially true for the increasing number of Idahoans with diabetes. Identifying and managing high blood pressure early and continuously can prevent heart attacks and strokes.

The Toolkit provides information on accurately and reliably taking a blood pressure measurement, how to properly maintain the blood pressure equipment, and patient education materials and tools.

We are interested in your comments about the video and the Toolkit. **To receive a Certificate of Completion, please complete the online Blood Pressure Toolkit evaluation form after you have watched the *Blood Pressure Sites & Sounds* video.** You must complete the evaluation form to access the Certificate. For technical assistance, please contact 208-334-5610.

Sincerely,

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REFERENCES

American Academy of Family Physicians www.familydoctor.org

American Heart Association www.heart.org

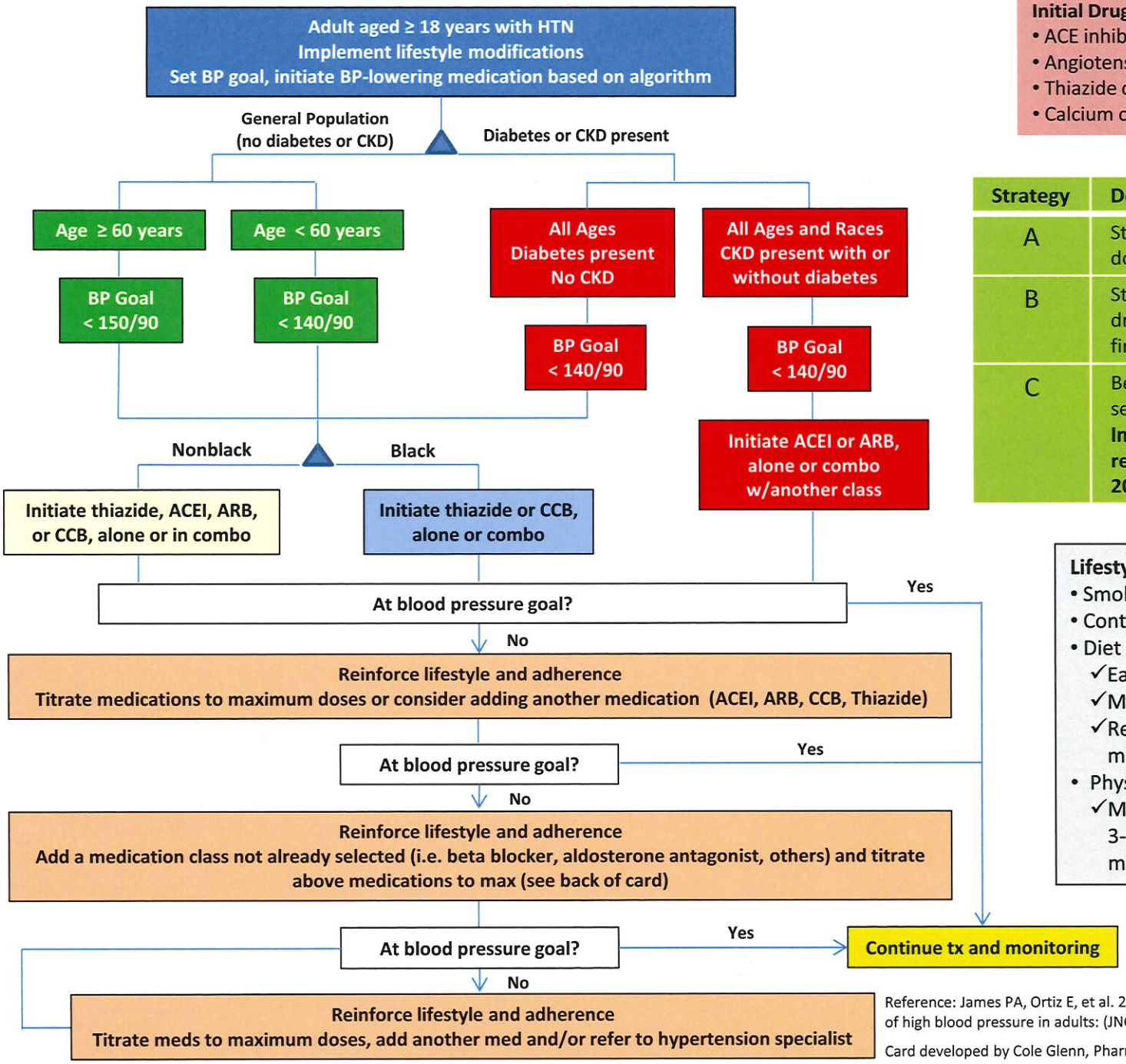
National Heart, Lung and Blood Institute (NHLBI) www.nhlbi.nih.gov/health-topics/high-blood-pressure

Blood Pressure Guidelines www.aafp.org/afp/2014/1001/p503.htmlm

Dash Eating Plan (Available from NHLBI) www.nhlbi.nih.gov/health-topics/dash-eating-plan

High Blood Pressure Education Materials https://www.cdc.gov/bloodpressure/materials_for_professionals.htm

JNC 8 Hypertension Guideline Algorithm



Initial Drugs of Choice for Hypertension
- ACE inhibitor (ACEI)
- Angiotensin receptor blocker (ARB)
- Thiazide diuretic
- Calcium channel blocker (CCB)

Strategy	Description
A	Start one drug, titrate to maximum dose, and then add a second drug.
B	Start one drug, then add a second drug before achieving max dose of first
C	Begin 2 drugs at same time, as separate pills or combination pill. **Initial combination therapy is recommended if BP is greater than 20/10mm Hg above goal**

Lifestyle changes:
- Smoking Cessation
- Control blood glucose and lipids
- Diet
  - ✓Eat healthy (i.e., DASH diet)
  - ✓Moderate alcohol consumption
  - ✓Reduce sodium intake to no more than 2,400 mg/day
- Physical activity
  - ✓Moderate-to-vigorous activity 3-4 days a week averaging 40 min per session.

Reference: James PA, Ortiz E, et al. 2014 evidence-based guideline for the management of high blood pressure in adults: (JNC8). JAMA. 2014 Feb 5;311(5):507-20

Card developed by Cole Glenn, Pharm.D. & James L Taylor, Pharm.D.

Hypertension Treatment

Compelling Indications	
Indication	**Treatment Choice**
Heart Failure	ACEI/ARB + BB + diuretic + spironolactone
Post –MI/Clinical CAD	ACEI/ARB AND BB
CAD	ACEI, BB, diuretic, CCB
Diabetes	ACEI/ARB, CCB, diuretic
CKD	ACEI/ARB
Recurrent stroke prevention	ACEI, diuretic
Pregnancy	labetolol (first line), nifedipine, methyldopa

Beta-1 Selective Beta-blockers - possibly safer in patients with COPD, asthma, diabetes, and peripheral vascular disease:

- metoprolol
- bisoprolol
- betaxolol
- acebutolol

Drug Class	Agents of Choice	Comments
Diuretics	H m 12.5-SOmg, chlorthalidone 12.5-25mg, indapamide 1.25-2.Smg triamterene 100mg *K+ sparing*- spironolactone 25-SOmg, amiloride 5-lOmg, triamterene 100mg furosemide 20-80mg twice daily, torsemide 10-40mg	Monitor for hypokalemia Most SE are metabolic in nature Most effective when combined w/ ACEI Stronger clinical evidence w/chlorthalidone Spironolactone - gynecomastia and hyperkalemia Loop diuretics may be needed when GFR <40mL/min
ACEI/ARB	*ACE/:* lisinopril, benazapril, fosinopril and quinapril 10-40mg, ramipril 5-lOmg, trandolapril 2-8mg ***ARB:*** candesartan 8-32mg, valsartan 80-320mg, losartan 50-lOOmg, olmesartan 20-40mg, telmisartan 20-80mg	SE: Cough (ACEI only), angioedema (more with ACEI), hyperkalemia Losartan lowers uric acid levels; candesartan may prevent migraine headaches
Beta-Blockers	metoprolol succinate 50-lOOmg and tartrate 50-lOOmg twice daily, nebivolol 5-lOmg, propranolol 40-120mg twice daily, carvedilol 6.25-25mg twice daily, bisoprolol 5-lOmg, labetalol 100-300mg twice daily,	Not first line agents - reserve for post-MI/CHF Cause fatigue and decreased heart rate Adversely affect glucose; mask hypoglycemic awareness
Calcium channel blockers	*Dihydropyridines:* amlodipine 5-lOmg, nifedipine ER 30-90mg, *Non-dihydropyridines:* diltiazem ER 180-360 mg, verapamil 80-120mg 3 times daily or ER 240-480mg	Cause edema; dihydropyridines may be safely combined w/ B-blocker Non-dihydropyridines reduce heart rate and proteinuria
Vasodilators	hydralazine 25-lOOmg twice daily, minoxidil 5-lOmg terazosin 1-Smg, doxazosin 1-4mg given at bedtime	Hydralazine and minoxidil may cause reflex tachycardia and fluid retention - usually require diuretic+ B-blocker Alpha-blockers may cause orthostatic hypotension
Centrally-acting Agents	clonidine O.l-0.2mg twice daily, methyldopa 250-SOOmg twice daily guanfacine 1-3mg	Clonidine available in weekly patch formulation for resistant hypertension

LIFESTYLE CHANGES TO LOWER BLOOD PRESSURE

Lifestyle changes can help to prevent and/or manage high blood pressure. "Adoption of healthy lifestyles by all persons is critical for the prevention of high blood pressure and is an indispensable part of the management of those with hypertension. Major lifestyle modifications shown to lower blood pressure include weight reduction in those individuals who are overweight or obese, adoption of the Dietary Approaches to Stop Hypertension (DASH) eating plan, dietary sodium reduction, increase of physical activity, and moderation of alcohol consumption". (JNC8)

1. **Lose Weight if Overweight or Obese**
   The latest national guidelines state that increased weight is a risk factor for cardiovascular disease, thus increasing the chance of having heart attacks or strokes. Provide the patient with their Body Mass Index (BMI) value and waist measurement and discuss their status. Provide patient with educational materials.
   [Free patient materials available at www.healthtools.dhw.idaho.gov]

2. **Adopt the DASH Eating Plan**
   The DASH eating plan (Dietary Approaches to Stop Hypertension) is high in fruits and vegetables (which are rich in potassium, calcium and magnesium). The plan recommends low fat dairy products and lean meats to reduce saturated fat and cholesterol. This eating plan has been proven to help reduce BP. In fact a 1500mg sodium DASH eating plan has effects similar to single drug therapy. (JNC8) Provide patient with educational materials on the DASH eating plan and review with the patient. [Free patient materials available at www.healthtools.dhw.idaho.gov]

3. **Reduce Sodium Intake**
   The benefit of limiting sodium intake to prevent or control high blood pressure has been a controversial issue for years. The National Institutes of Health (NIH) in May 2000 released the results of a clinical study that showed a large benefit to blood pressure from reduced dietary sodium. The DASH-Sodium trial, a multi-center 14-week feeding study showed that "the lower the amount of sodium in the diet, the lower the blood pressure, for both those with and without hypertension. Provide patient with educational materials. [Free patient materials available at www.healthtools.dhw.idaho.gov]

4. **Increase Aerobic Physical Activity**
   Regular physical activity should be encouraged as a means of weight control, to improve cardiovascular fitness and to reduce blood pressure. Current guidelines are for individuals to have at least 2.5 hours of moderate-intensity physical activity per week. Provide patient with educational materials. [Free patient materials available at www.healthtools.dhw.idaho.gov]

5. **Limit Alcohol**
   Men should limit their alcohol consumption to less than 24 ounces of beer, 10 ounces of wine, or 2 ounces of liquor per day and only half these amounts for women and lighter weight persons. Review these guidelines with patients who consume alcohol.

6. **Stop Smoking!**
   Advise and assist patients to stop smoking if they smoke. Provide patient materials on smoking cessation.
   [Free patient materials available at www.healthtools.dhw.idaho.gov]

COMMON CAUSES OF BLOOD PRESSURE MEASUREMENT ERRORS

Manometer

Cause	Effect	Correction
Loss of mercury.	Reading too low.	Have mercury added.
Too much mercury.	Reading too high.	Have extra mercury removed or have system cleaned.
Clogged diaphragm.	Mercury will not rise easily or bounces.	Have diaphragm replaced.
Dirty mercury or dirty acrylic tube.	Mercury meniscus is irregular and reading is impaired.	Have mercury and acrylic tube cleaned.

Inflation System

Cause	Effect	Correction
Bladder too small.	High reading.	Use the proper size cuff. The circumference and diameter of the arm determines the size needed.
Bladder too large.	Low reading.	Use the proper size cuff. The circumference and diameter of the arm determines the size needed.
A leak in the bladder or tubing.	Mercury continues to fall when valve is closed.	Replace bladder or tubing.
Bladder not centered over artery.	High reading.	Use proper technique.
Cuff not applied snugly.	High reading.	Reapply cuff.
Cuff applied over clothing.	Incorrect reading.	Apply cuff to bare arm.
Pressure bulb has air leaks.	Mercury continues to fall when valve is closed.	Replace bulb.
Control valve “sticks.”	Unable to control deflation.	Replace valve.
Control valve dirty, worn, or has broken parts.	Mercury continues to fall when valve is closed.	Have valve repaired or replaced.

Stethoscope

Cause	Effect	Correction
Ear tips not forward.	Impairs screener’s ability to hear the BP sounds.	Use proper technique.
Stethoscope placed under cuff or near tubing.	False sounds-incorrect reading.	Use proper technique.
Stethoscope applied with heavy pressure.	Sounds may be heard below the true diastolic resulting in an incorrect reading.	Use proper technique.

COMMON CAUSES OF BLOOD PRESSURE MEASUREMENT ERRORS
(CONTINUED)

Screenee

Cause	Effect	Correction
Slouched.	High reading.	Have screenee sit up straight.
Brachial pulse below heart level.	High reading.	Place arm so that brachial is at heart level.
Arm not fully supported on stable surface.	High reading.	Place entire arm on desk, table.
Brachial pulse above heart level.	Low reading.	Place arm so that brachial is at heart level.
Clothing around arm too tight.	Incorrect reading.	Remove clothing on arm.
Leaning on arm.	High reading.	Have screenee sit back in chair with no weight on arm.

Screener

Cause	Effect	Correction
Inflation rate slow or inconsistent.	Incorrect reading may cause auscultatory gap.	Maintain rapid and constant inflation rate.
Cuff inflated too high.	Painful to screenee and may cause incorrect reading.	Determine MIL.
Deflation rate too slow.	High diastolic reading and may cause auscultatory gap.	Deflate at 2-3 mmHg per second.
Deflation rate too fast.	Low reading.	Deflate at 2-3 mmHg per second.
Cuff reinflated after deflation has begun.	Incorrect reading.	Deflate cuff completely. Wait 15-30 seconds before reinflating.
Observer bias, digit preference, cut-point bias, previous reading bias or fatigue.	Incorrect reading.	Be aware of and on guard against these problems.

TESTING ANEROID MANOMETERS FOR ACCURACY

The aneroid manometer consists of a round gauge connected by tubing to a blood pressure. This instrument is reliable and easy to use as long as it is checked regularly to determine its accuracy
(every 3-6 months depending on frequency of use). The mechanical workings of the aneroid manometer are more easily disturbed than those of a mercury manometer. The dial at the zero mark of an aneroid under no pressure does not mean that the instrument will provide accurate readings. The aneroid must be checked against a mercury manometer (at several points throughout the range) to establish its accuracy. Mercury manometers will provide accurate readings if the mercury is at "0" on the scale when the instrument is not under any pressure and if the mercury is not dirty or does not bounce excessively on deflation. Companies that specialize in servicing and repair of laboratory equipment can usually test and calibrate aneroids.

Test for Accuracy of Aneroid Manometers

Equipment needed:

- Aneroid manometer to be tested.
- Mercury manometer.
- Y-Connector. (Note: A "calibration Y-Connector" can be purchased at most medical supply firms.)
- Bulb and valve from aneroid.

Technique:

- Remove coiled tubing from mercury manometer. Connect one end of "Y" connector to mercury manometer.
- Connect the other end of "Y" to aneroid manometer gauge.
- Connect tail of "Y" tubing to aneroid's pressure bulb.
- Hold aneroid gauge at same level as mercury manometer (for accurate viewing).
- Inflate mercury gauge to 4 different test levels (60, 120, 180, and 240 mmHg).
- Compare aneroid reading to reading on mercury manometer at each level and compute average deviation.
- If not accurate within plus or minus 2-4 mmHg at any one test level or as an average deviation of the four test levels, then discontinue use and replace or repair faulty gauge.

Additional checks:

- Bladder: Should be intact without leaks. Center of bladder should be marked.
- Tubing: Should have no leaks.
- Valve: Should not stick or leak.
- Cuff: Should fasten securely.

SUMMARY OF BLOOD PRESSURE MEASUREMENT TECHNIQUE

1. Patient position:

a. Seated with feet flat on floor.
b. Leaning against back of chair, not on their arm.
c. Entire arm fully supported on table with brachial artery at heart level.
d. Upper arm should be bare — **do not apply cuff over clothing.**

2. Cuff size:

a. Most modern cuffs are marked with range lines to denote need to use larger or smaller cuff.
b. If cuff isn't marked, the screener must ensure that the rubber bladder covers 80% of the circumference of the arm (100% in children) and that the width of the bladder covers 40% of the circumference of the arm.

3. Cuff placement:

a. Apply the proper-sized cuff **snugly** to bare upper arm.
b. Place center of bladder directly above brachial artery.
c. Place bottom edges of cuff about 1" above the crease in the elbow.

4. Palpate (feel) for radial pulse.

5. Inflate manometer while palpating radial pulse:

a. Note level at which radial pulse disappears.
b. Release air from cuff rapidly.

6. Wait 15 seconds and then:

a. Palpate brachial pulse.
b. Place ear tips of stethoscope in ears with tips facing forward.
c. Place stethoscope over brachial artery **not touching the cuff.**

7. Measure blood pressure by:

a. Rapidly inflating cuff to a level 20-30 mmHg above the point where the radial pulse disappeared.
b. While slowly releasing the air in the cuff, listen for the Korotkoff sounds.

The first of two consecutive sounds is recorded as the systolic pressure. The diastolic is recorded at the level where the sound disappears.

8. When the sound disappears:

a. Continue to deflate the cuff slowly for another 10 mmHg.
b. If no further sounds are heard, rapidly release all air in the cuff and record the BP.

RECOMMENDATIONS AND MATERIALS FOR EDUCATING YOUR PATIENTS

This information should be individualized to each patient. Written educational materials should be appropriate for the patient's literacy level, culturally sensitive, and available to patients to take with them when they leave. Every patient should be minimally educated according to the following recommendations at the time of BP measurement.

Protocol

1. List and briefly explain the controllable and uncontrollable risk factors for heart disease and stroke.

Controllable	Uncontrollable
Smoking	**Heredity** (history in immediate family of a CVD event or sudden death before age 55)
Obesity	**Gender** (risk is higher starting at age 45 in men and age 55 in women who are lacking exercise)
High blood pressure	**Race**
Lack of exercise	**History of prior cardiovascular event**
High blood cholesterol	
Low HDL cholesterol	
Diet	

2. Educate the individual about the risk factors he/she has, identifying those risks that the patient could improve through lifestyle behavior modification. Discuss any co-morbid conditions and complications (i.e. chronic kidney disease, diabetes, etc.) with patient.

3. Provide patient with a written copy of their blood pressure numbers and explain where their results fall according to national guidelines. [Free patient materials available at www.healthtools.dhw.idaho.gov]

4. Tell the patient that a single blood pressure measurement does not constitute a diagnosis of hypertension.

5. If you are not the patient's primary healthcare provider, refer the patient to their health care provider for further counseling if their BP measurement is not within normal range and/or if they need counseling for any other risk factor. Refer patient to services as appropriate, a dietitian for nutrition counseling or smoking cessation services.

6. Answer any questions the patient may have about his/her results.

Thank you for reviewing the provider materials please proceed to the Blood Pressure Sights & Sounds Video. Note: while watching the video, it will be helpful to have the "Summary of Blood Pressure Measurement Technique" from page 9 in front of you.

If the link above does not work please copy and paste the following URL into your web browser:

http://healthandwelfare.idaho.gov/Health/DiseasesConditions/HeartDiseaseStrokePrevention/BloodPressureToolkit/BloodPressureSightsandSoundsVideo/tabid/2150/Default.aspx